QK1
.M593
V.12
1924
cpy 2

MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME XII
WITH 43 PLATES
1924

ST. LOUIS, MISSOURI

PUBLISHED MONTHLY EXCEPT JULY AND AUGUST,
BY THE BOARD OF TRUSTEES

SUBSCRIPTION PRICE:

ONE DOLLAR PER YEAR SINGLE NUMBER TEN CENTS

MISSOURI BOTANICAL
GARDEN LIBRARY

Missouri Botanical Garden Bulletin

Vol. XII JANUARY, 1924 No. 1

CONTENTS

	Page
Thirty-fifth Annual Report of the Director	1
Statistical Information	23

ST. LOUIS, MO.
1924

Published Monthly Except July and August by the Board of Trustees

SUBSCRIPTION PRICE:

ONE DOLLAR PER YEAR SINGLE COPIES TEN CENTS

BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

President
EDWARDS WHITAKER.

Vice-President
DAVID S. H. SMITH.

SAMUEL C. DAVIS.

EDWARD C. ELIOT.

GEORGE C. HITCHCOCK.

THOMAS S. MAFFITT.

EDWARD MALLINCKRODT.

A. C. F. MEYER.

PHILIP C. SCANLAN.

JOHN F. SHEPLEY.

EX-OFFICIO MEMBERS

HERBERT S. HADLEY,
Chancellor of Washington University

HENRY W. KIEL,
Mayor of the City of St. Louis

FREDERICK F. JOHNSON,
Bishop of the Diocese of Missouri

GEORGE T. MOORE,
President of The Academy of Science of St. Louis

HENRY A. ROSSKOPF,
President of the Board of Education of St. Louis

CHARLES A. ROE, Secretary.

VIEW THROUGH MAUSOLEUM GATE TOWARDS OLD RESIDENCE.

Missouri Botanical Garden Bulletin

Vol. XII JANUARY, 1924 No. 1

THIRTY-FIFTH ANNUAL REPORT OF THE DIRECTOR

Gentlemen:

I have the honor to submit herewith the thirty-fifth annual report of the Director.

The year 1923 was a notable one for the Garden in more than one respect. Of first importance was the decision to dispose of the pasture land west of the Garden. This was necessary that funds might be obtained for securing a large out-of-town tract as a growing area for the propagation and development of plants and trees to be temporarily shown or permanently established at the city garden.

The successful expedition to Colombia, Panama, and the West Indies, which resulted in the addition to the Garden collections of large numbers of orchids, tree ferns, and other tropical plants, was also a noteworthy achievement. While no new greenhouses have been built during the year, nor have there been extensive changes in the Garden proper, the construction of a new brick house for the use of the night engineer, at the corner of Shaw and Alfred Avenues, is worthy of special mention. The advantage of having both the engineers live within the Garden is obvious, and with the subdividing of the pasture land it became necessary for the night engineer to vacate the old frame house erected by Mr. Shaw about seventy-five or eighty years ago.

Minor changes were the removal of all perennials from the Linnean garden and the increase in the number of iris and peonies with the idea of making this a real spring garden;

the extension of the plots for testing various grass mixtures to be used on lawns and golf courses, this feature now comprising some thirty experiments calculated to furnish definite information as to the best mixtures for specific purposes in and around St. Louis; the building of a small garden east of the floral display house for exhibition during the St. Louis Garden Club show; and the addition of some 2,000 shrubs to the nursery. This latter now includes over 10,000 trees, shrubs, and perennials, the majority of which will be ready for use in the spring for planting along Alfred Avenue. Fifteen hundred hardy chrysanthemums, comprising forty-five varieties, were likewise grown here during the summer and transplanted for display in the Garden beds early in the fall.

In addition to the usual flower shows, comprising the chrysanthemums, orchids, cinerarias, amaryllis, begonias, caladiums, etc., there was held early in October the first dahlia show ever attempted in St. Louis. While this was something of an experiment, the results showed such a wide interest in the dahlia among amateurs in St. Louis that it will probably become an annual event. The fourth annual show of the Garden Club of St. Louis was held May 26 and 27, and for the first time this was restricted entirely to amateurs, the growth of interest in the show making it no longer necessary to depend upon exhibits from commercial growers. At the fall show held at the Armory by the St. Louis Flower Show Association the Garden exhibited orchids, a collection of hardy chrysanthemums, and some of the more interesting economic plants brought from the West Indies in bamboo pots. While the Garden did not enter these displays in competition, one of our new water-lilies, "General Pershing," was awarded the silver medal given by the Society of American Florists and Ornamental Horticulturists. The Shaw gold medal which has not been awarded for several years went to Mr. J. H. Hill, of Richmond, Indiana, for his new rose "Sensation". The St. Louis Aquarium Society held an exhibition at the Garden on September 14, 15 and 16. Over a hundred aquaria containing over fifty varieties of fish were entered. The Garden displayed some thirty varieties of aquatic plants, many of them adapted for aquarium purposes. Although this exhibit was not in competition for a prize, it was so favorably re-

ceived by the public that the St. Louis Aquarium Society awarded to the Garden a silver cup as a special prize.

In addition to the routine painting and repairs incident to the upkeep of the Garden for the year, the exteriors of most of the growing ranges were painted as well as the ironwork of the roof of the Linnean house and a considerable amount of iron fence. The rose pergola was also painted early in the spring. A long-needed addition to the irrigation system was installed throughout the principal beds in the main garden.

OUT-OF-TOWN ADDITION TO THE GARDEN

The history of other botanical gardens established within city limits has been that eventually they have been compelled to move to other localities, either because of the difficulty of properly growing plants in a city atmosphere or in order to obtain additional room for expansion. For years it has been recognized that it is not possible to grow to perfection many trees and plants at the Garden, this difficulty being experienced in the greenhouses as well as outdoors, and it was felt that there was no other alternative than to abandon the present location. On the other hand, the necessity for giving up the present accessible location seemed to be unfortunate. By far the greater number of visitors to the Garden come by street-car or on foot. Actual counts made on Sunday afternoons when 10,000 or more people were at the Garden showed that not more than 15 per cent came by automobile. To move the Garden outside the city to a distance sufficient to insure its favorable location for the next fifty or one hundred years would at once greatly reduce its influence as a recreational and educational institution. The visits of schools and similar groups in a body would be practically eliminated. To abandon the present location of the Garden would likewise involve the moving of the library, herbarium, and laboratory, as well as the two schools maintained at the Garden. With many commercial and educational institutions of the city dependent upon these branches of the Garden for assistance and advice, it would seem unfortunate to make them so much less accessible than they now are. We were thus faced with the absolute necessity of finding a more favorable location for the growing of the material used at the Garden, coupled with the very great desirability of maintaining the efficiency of the Garden

by keeping it within the reach of the public, two horns of a dilemma which appear to be irreconcilable. After careful consideration the solution of this problem seems to be to leave undisturbed, at least for the present, the buildings and grounds of the present location, together with its scientific and educational features, but to maintain it as a show place, much as it has been in the past, and to acquire land outside of St. Louis where much of the indoor floral display material and the plants and trees to be used outside can be grown; in other words, to regard the present improved portion of the Garden as the city showroom and to have the factory away from the poisonous atmospheric conditions of the city where the best possible results can be produced. The primary object of securing land at a considerable distance from the city would be for the purpose above indicated, but steps would be taken at once to develop a real arboretum, and there should also be secured a considerable area of natural forest with its undergrowth, which could be preserved for all time as a reservation. It should also be borne in mind that many years hence this location would probably be the new botanical garden.

Since the funds of the Garden did not permit of any additional investment for Garden purposes, the only possible way by which this plan could be consummated was to dispose of the unimproved pasture land lying west of the existing garden. This would involve no decrease in the area which has always been open to the public, and the Board of Trustees, after carefully considering all of the factors involved, voted to adopt the plan. Authorization from the court being necessary in order to sell the land above referred to, the preliminary papers were filed and two hearings were held before Judge Davis of the Circuit Court. The Attorney General of the State, protecting the interests of the people, was represented by counsel on both occasions. On the first of March, 1923, the court did

"Adjudge and decree that the tract of ground immediately west of Shaw's Garden proper, bounded on the west by Kingshighway, on the northwest by Vandeventer Avenue, on the north by Shaw Avenue, on the east and southeast by land now occupied by Shaw's Garden, including the arboretum, and on the south by Shenandoah Avenue, containing fifty acres, more or less, be sold and aliened in fee, free from any of the conditions and restrictions contained in

the will of Henry Shaw and that such sale be made by the Trustees or their successors or a majority of them, either at public or private sale, on such terms and conditions as such trustees may deem advisable, and that the proceeds of said sale be expended for the use and benefit of said trust, including the purchase of such additional tracts of ground away from the atmospheric influences of the city sufficiently far to successfully carry out the objects of said trust in the propagation and growing of plants, shrubs, flowers, etc., as set out in the will of Henry Shaw, deceased, including the erection of necessary equipment and improvements thereon, and that the balance of the proceeds be invested as set forth in the third paragraph of the original decree herein."

This, with other provisions of the decree, has made it possible to legally dispose of the area in question, and immediately plans were made for subdividing and improving the land and placing it upon the market. The improvements are progressing as rapidly as possible and already sufficient sales have been made to insure the success of the project.

This move, which preserves the existing garden in its present location for a much longer period than would otherwise have been possible and yet permits the Board to acquire a large tract of land beyond the city for the purposes indicated, should be regarded as one of the most fundamental improvements undertaken since the trust was bequeathed to the Trustees by Henry Shaw. Only those who have given the entire scheme careful consideration can appreciate what it means to the Missouri Botanical Garden and to the citizens of St. Louis. As soon as the new location is secured and the various nurseries and greenhouse collections established, immediate improvement may be expected in the general appearance of the Garden as well as in the character of the floral displays, both indoors and out. That the proposed change has met with the universal approval of all those who understand what is involved is evidenced by the favorable expressions of opinion received from all quarters, including resolutions indorsing the contemplated change and wishing the Garden every success in the new venture from the St. Louis Association of Gardeners, the St. Louis Florist Club, and similar organizations. It is not too much to say that a crisis in the administration of the Garden has been successfully passed and that within a comparatively few years the citizens of St. Louis will have even greater cause to be proud of the

institution so beneficently placed at their disposal by Henry Shaw.

EXPEDITION TO CENTRAL AND SOUTH AMERICA FOR ORCHIDS

While the collection of orchids at the Missouri Botanical Garden has long been recognized as one of the best of its kind in the country, it was thought desirable to secure a much larger number of the showy species in order to make our orchid displays even more attractive. The splendid gift of the late D. S. Brown added hundreds of plants to the collection, but we still lacked in any quantity the varieties which in the eyes of the public constitute the most important part of an orchid show. Owing to the war and the increased difficulty of getting plants from the tropics into the United States, it became necessary to send some one to the native home of these plants in order to secure them. Mr. George H. Pring, Horticulturist to the Garden, agreed to go and on the first of April left St. Louis for Bogota, Colombia. No single undertaking of the Garden has ever received anything like the publicity given to this expedition. Not only the local press but newspapers throughout this country and abroad, as well as all the leading horticultural and floricultural magazines, have devoted an unusual amount of space to recording the results of Mr. Pring's trip. In addition, Mr. Pring has given repeatedly the illustrated talk first delivered at the Trustees' Banquet on October 10, and has on more than one occasion broadcasted over the radio his interesting experiences. In the September, October, and November numbers of the BULLETIN a more detailed account of the results of the expedition are to be found. Suffice it to say that no effort made by the Garden during its existence has been so fruitful in adding to its permanent collections not only orchids of great value but also tree ferns, economic plants, and other plants of much popular and scientific interest.

INCREASED INTEREST IN AND APPRECIATION OF THE GARDEN

The number of visitors to the Garden, now over three times that of a decade ago, is but one evidence of the important position which this institution holds in the com-

munity and in the country. To a greater extent than ever before the Missouri Botanical Garden is recognized as a source of information along botanical lines, and the increase in the requests from commercial concerns, educational and scientific institutions, as well as private individuals from all over the country, has more than kept pace with the increase in attendance. The way in which the Garden is called upon to furnish information from either its library, herbarium, laboratories, or garden staff, on every conceivable aspect of plants or their products, is a constant source of wonder. While this might be expected from the citizens of St. Louis, the greater number of requests come from individuals and concerns so far away that one is surprised that they ever heard of the Missouri Botanical Garden. Of course, the publications of the Garden are widely distributed, the ANNALS going to practically every botanical institution in the world and the BULLETIN reaching a vast number of plant lovers in this country. A recent letter from the director of a foreign botanical garden states: "We get the publications from your garden regularly and find many exceedingly able and useful monographs and articles therein. In fact, we constantly refer to them in our every-day work." And the head of a French scientific society writes: "We have just received the recent number of your Annals. This interesting publication, which we greatly appreciate, is a welcome addition to our library, where it holds one of the best places, as it justly should." The inclusion of our flower shows in the national and international circuits of several moving-picture concerns has likewise done much to inform the world of some of the activities at the Garden, and within the last year or two the radio has likewise been a factor in disseminating information from the Garden. Practically all of the conventions which come to St. Louis devote a part of their program to a visit to the Garden, and this likewise assists in acquainting people away from St. Louis with the institution. During the past year two interviews were published in a local paper, one from a man from Spain, the other from North Dakota, and if all visitors are impressed in the same way it is easy to understand why the Missouri Botanical Garden commands the position it does.

"The Missouri Botanical Garden has left the deepest impression on my wife and myself. I have never seen such a perfect collection of botanical specimens anywhere else. The obvious intelligence of the care given to these flowers and plants speaks well for the vision of whomever founded the Garden." [Barcelona, Spain.]

"The beauty of arrangement and the many wonderful flowers found at Shaw's Garden make it the most striking in the world." [Bismarck, North Dakota.]

The question is often asked how the Missouri Botanical Garden ranks in comparison with similar institutions throughout the world. Because of the unique character of the Garden, it being neither a part of a park system nor connected directly with an institution of learning, it is difficult to make any just comparison. Until the out-of-town garden is established, the area is considerably smaller than some other botanical gardens; but in its appeal to the casual visitor as well as to the student of plants, it possesses certain features not to be duplicated elsewhere. It is obviously impossible to compare a garden located in the middle west of North America with a similar institution to be found in the tropics, and yet it is only fair to say that considering the limitations imposed by climate as well as the restricted income (much less than that available for many other gardens) it is the greatest of its kind in the world. As was pointed out at length in my report for 1921, the only source of income for the Garden is from the estate of Mr. Shaw. With similar institutions receiving increasing amounts each year from the city or the state or the nation, to which are frequently added private gifts of large amounts, it will easily be seen how difficult it is to maintain the high standard set by Mr. Shaw in competition with other gardens. This is further complicated by the fact that the Garden pays taxes on all its revenue-producing property and is still deprived, as it has been for the past thirty-five years, of any revenue from the two-hundred-foot strip which Mr. Shaw expected would considerably augment the Garden's revenue.

THE SCHOOL FOR GARDENING

As definitely provided for in Mr. Shaw's will, instruction is given at the Garden to regularly enrolled pupils in subjects calculated to give them a wide knowledge of plants. General floriculture and horticulture, together with such special topics

as plant breeding, diseases of plants, soils and fertilizers, entomology, etc., are well taken care of, and landscape architecture, from mechanical and free-hand drawing to the principles of landscape design, is offered. In addition to the formal courses, all the facilities of the Garden are placed at the disposal of the pupils in a way calculated to give them practical experience in the propagation and care of a great variety of plants both outdoors and in the greenhouses. When satisfactorily completed, a three years' course at the Garden is recognized as fitting students to an unusual degree for a variety of professional work along landscape and gardening lines. During the past year the enrollment, including vocational students, has been eighteen, a number larger than in any previous year and more than we properly are prepared to take care of. Four vocational students completed their training during the year and are now holding good positions. In the regular course Miss Edith Mason and Miss Katherine Perkins have continued the work begun a year ago, and Mr. Joseph Crupe and Miss Ruth Dowell have been admitted to advanced standing. Mr. H. E. White, Miss Fern Goss, and Mr. Joseph Grimme were enrolled for the regular three years' course. The high standard of the school is evidenced by the fact that all of these students have successfully fulfilled the entrance requirements of Washington University, four having had previous college work and one having obtained the master's degree in botany. The remaining students, assigned to the Garden by the United States Veterans' Bureau, have had varying amounts of schooling, but all have made a satisfactory record. It is universally recognized that the training in gardening given to the vocational men by the Missouri Botanical Garden is the best of the kind offered in this country.

ANNUAL BEQUESTS

The annual flower sermon, provided for in the will of Mr. Shaw, was preached at Christ Church Cathedral on Sunday, May 27, by the Rev. W. Russell Bowie, of Grace Church, New York City.

The Trustees' Banquet was held on the evening of October 10 at the Hotel Chase, the special occasion being the convention of the Florists' Telegraph Delivery Association. Since this was the first time the Trustees' Banquet has ever been

attended by so many out-of-town guests, there being nearly seven hundred delegates present, the banquet was of a somewhat different nature from those previously given. It is probably true, however, that never before has this bequest of Mr. Shaw's been so thoroughly appreciated. Instead of the usual program of speakers, Mr. George H. Pring, Horticulturist to the Garden, gave an illustrated account of his trip for orchids. The local florists were especially pleased at the assistance given them in entertaining their out-of-town guests, and all of the trade papers commented at length on both the banquet and the visit of the delegates to the Garden. On the occasion of this visit a wreath of magnolia leaves and dahlias was placed at the tomb of Mr. Shaw as an expression of the kindly relations existing between the florists and the Missouri Botanical Garden.

The bequest provided by Mr. Shaw for "premiums or prizes at a flower show or exhibit" was used in part for prizes at the fall flower show given by the St. Louis Flower Show Association.

RESEARCH AND INSTRUCTION

During the year 1923 the experimental or laboratory investigations have been most varied in type. Studies along the line of metabolism of the fungi have continued to receive much attention, especially in the direction of nitrogen metabolism and the relation of pathogenic citrus-inhabiting forms to citric and other organic acids. The location of a "Sulphur Fellowship" with the graduate laboratory by the Crop Protection Institute has resulted in an extremely interesting investigation of the nature of the toxic compound in the sulphur-containing sprays and dusts. The problem seems to have been solved by the determination that this compound is pentathionic acid, and that it is a product related to a state of division of the sulphur particles. On this account colloidal sulphur preparations have been given the greater consideration. During the latter part of the year field experiments have been designed (located primarily at Geneva, New York) by the Institute to determine the application of the principles to field work. Other graduate students have pursued studies dealing with the etiology and physiology of a few fungous diseases. The mosaic disease of tobacco has occupied much

of the attention of some members of the staff, and further interesting data have been secured bearing upon the nature of the infective agencies in this enormously destructive disease. At the same time investigations have been instituted to determine the possibility of studying the life cycles of bacteria by means of ultra-filtration, thus applying some principles deduced in the case of the mosaic disease to a study of the life history of the bacteria in general. Finally, the pigmentation of fruits, a study begun during the previous year, has been brought to conclusion.

For the first semester of 1923-24 there have been offered the usual research courses, the seminar, and three lecture laboratory courses, somewhat more than the average number, but during the second semester the number will be reduced to not more than two.

Published Articles and Notes.—Since the previous report four numbers of the ANNALS have appeared, including No. 4 of Volume IX, and Nos. 1, 2, and 3 of Volume X. The articles appearing in these numbers in order of appearance are as follows:

Rosen, H. R. "A Bacterial Disease of Foxtail (Chaetochloa lutescens)." Col. IX, pp. 332-402.

Young, H. C. "The Toxic Property of Sulphur." Vol. IX, pp. 403-435.

Jennison, H. M. "Potato Blackleg, with Special Reference to the Etiological Agent." Vol. X, pp. 1-72.

Greenman, J. M. "Studies of South American Senecios." pp. 73-110.

Lehman, S. G. "Pod and Stem Blight of Soybean." pp. 111-178.

Burt, E. A. "Higher Fungi of the Hawaiian Islands." pp. 179-189.

Duggar, B. M., and Joanne Karrer Armstrong. "Indications Respecting the Nature of the Infective Particles in the Mosaic Disease of Tobacco." pp. 191-212.

Camp, A. F. "Citric Acid as a Source of Carbon for Certain Citrus Fruit-Destroying Fungi." pp. 213-298.

Besides the articles listed above, attention should be drawn to the many shorter and popular articles in the BULLETIN, likewise to several articles appearing in garden craft and

scientific periodicals not published by the Garden, as follows:

Jensen, L. P. Article in the St. Louis Globe-Democrat, "The Destruction of Wild Flowers Due to Injudicious Picking."

Jensen, L. P. Article in the September-October number of Parks and Recreation, "Arboretums in Connection with the Park System."

Moore, George T. A chapter in "Science Remaking the World", Doubleday, Page & Co., on "The Educational Value of Modern Botanical Gardens."

Duggar, B. M. In Industrial and Engineering Chemistry, review of Palmer's "Carotinoids and Related Pigments. The Chromolipoids."

Scientific and Popular Lectures and Papers.—During the year a number of lectures have been delivered, or papers read, on scientific and popular topics by members of the scientific and Garden staffs to special audiences as follows:

John H. Kellogg, January 8, before the scoutmasters of Webster Groves, Missouri, "Our Native Trees."

B. M. Duggar, January 16, before the St. Louis Garden Club, "Shrubs for Fall Effects in Fruit and Foliage."

L. P. Jensen, January 17, before the St. Louis Natural History Museum Association, "The Call of Humanity—Preserve Our Forests!"

John H. Kellogg, January 18, before the Liberty Prairie Women's Club, Liberty Prairie, Illinois, "Ornamental Planting on the Farm."

George T. Moore, February 12, before the Blue Hydra Society of the University of Cincinnati, "Botany and Business."

George T. Moore, February 13, before the Chamber of Commerce of Cincinnati, "The Relation of the Botanical Garden to Business and Industrial Life."

George T. Moore, February 13, before the Cincinnati Chapter of the Wild Flower Preservation Society, "The Relation of a Botanical Garden to Civic Life as Illustrated by the Missouri Botanical Garden."

John H. Kellogg, February 14, before the Boy Scouts Troop No. 90, at Temple Shaare Emeth, "Winter Botany."

L. P. Jensen, February 14, before the St. Louis Park De-

partment Association, at the Swedish Hall, "The Preservation of Our Forests."

L. P. Jensen, February 16, before the Women's Club of Pana, Illinois, at the Elks' Club House, "Planting and Care of Home Grounds."

G. H. Pring, February 20, before the St. Louis Garden Club, "Water-lilies and Other Aquatic Plants."

George T. Moore, February 21, before the educational section of the Wednesday Club, "Have the School Virtues of Old Grown Obsolete?"

George T. Moore, March 6, before the Women's Chamber of Commerce, at the Hotel Claridge, "The Black Smoke Tax."

George T. Moore, March 19, before the Garden Club of Kirkwood, "Conserving Natural Resources."

George T. Moore, March 20, before the Greater St. Louis Conference, at the Statler Hotel, "The Smoke Nuisance."

L. P. Jensen, March 26, before the Women's Club of Litchfield, Illinois, "The Beautification of Home Grounds."

Edgar Anderson, April 17, before the Woodcraft Council, at the Union Avenue Christian Church, "Out-of-Door Experiences."

B. M. Duggar and Joanne K. Armstrong, April 21, before the American Philosophical Society, at Philadelphia, "Indications Respecting the Nature of the Infective Particles in the Mosaic Disease of Tobacco."

Edgar Anderson, April 24, before the Carpe Diem Literary Society, in the lecture room at the Garden, "The Activities of the Missouri Botanical Garden."

Edgar Anderson, April 24, broadcasted by the St. Louis Post-Dispatch radio station in connection with the Garden's co-operation in National Garden week, "Flowers for City Gardens."

J. M. Greenman, April 4, before the Illinois Academy of Science, at Galesburg, Illinois, "Opportunities for Botanical Research in Central America."

L. P. Jensen, April 26, before the "Be Square" class of the Kingshighway Presbyterian Church, "Conservation of Forests."

L. P. Jensen, April 30, before the Women's Club of Belleville, Illinois, "Beautification of Home Grounds."

L. P. Jensen, April 30, before the Belleville Chamber of Commerce, "The City Beautiful."

Edgar Anderson, May 16, before the pupils of the Kennard School, "Flower Families."

L. P. Jensen, May 21, before the St. Louis Association of Gardeners, at the Forest Park greenhouses, "Conservation of Forests."

L. P. Jensen, May 25, before the St. Louis District Greens Section, at the Algonquin Golf Club, "Obnoxious Insects and Their Control."

L. P. Jensen, June 11, before the Waterloo Commercial Club, at Waterloo, Illinois, "The Beautification of Cities."

L. P. Jensen, August 2, before the Chautauqua Association, Piasa, Illinois, "Wild Flowers."

G. H. Pring, August 20, broadcasted from the Grand Leader radio station, "Collecting Orchids in Colombia"; on September 11, the same lecture was broadcasted from the Post-Dispatch station; also given, October 8, before the St. Louis Landscape Association, at the American Hotel; October 15, before the Society of Sigma Xi; October 18, before the Clifton Heights Presbyterian Church; October 25, before the Missouri State Florists' Association at Sedalia; November 2, before The Richard Anderson Post, at the Armory; November 6, before the Current Topics Section of the Wednesday Club; November 7, before the St. Louis Association of Gardeners; November 13, before the St. Louis Aquarium Society; November 17, in the Flower Show Auditorium, Oklahoma City, Oklahoma; December 4, before the patrons' association of the Garfield School; and December 14, before the patrons' association of the Fremont School.

G. H. Pring, September 24, before the Maryland Terrace Association, "The Care of Lawns and Shrubbery."

L. P. Jensen, September 11, before the convention of the American Institute of Park Executives, in Kansas City, "Arboretums in Connection with the Park System."

L. P. Jensen, October 5, before the Webster Groves Nature Study Society, "The Beautification of Home Grounds."

G. H. Pring, October 10, at the Trustees' banquet, "Hunting Orchids in the Tropics."

G. H. Pring, October 12, before the Junior Chamber of Commerce, "What Is an Orchid?"

L. P. Jensen, October 24, before the Women's Club of Greenfield, Illinois, "The Use of Native Materials in Ornamental Planting."

L. P. Jensen, November 2, before the Boy Scout Class for the Merit Badge, at the Cabanne Branch Library, "Forestry."

George T. Moore, November 13, broadcasted from the Post-Dispatch radio station, "The Growing Interest in Flower Shows."

B. M. Duggar, December 1, before the Phi Sigma Society, "Science, an After-Dinner Attitude."

B. M. Duggar, December 28, before the physiological section of the Botanical Society of America, at the meetings of the American Association for the Advancement of Science, at Cincinnati, "Cell Activity and H-Ion Concentration—Some Problems in Metabolism and Absorption."

B. M. Duggar and Joanne K. Armstrong, December 28, before the American Naturalists, "Ultra-filtration as a Means of Studying the Life Cycles of Bacteria."

J. M. Greenman, December 29, before the systematic section of the Botanical Society of America, "Age and Area with Special Reference to the Flora of Tropical America."

Graduates, Fellows, and Investigators.—Laboratory or experimental research has been conducted, as heretofore, by members of the scientific staff of the Garden; graduate students, especially those registered as candidates for degrees in the Henry Shaw School of Botany of Washington University; and special investigators doing cooperative or independent research.

Graduate students.—During the calendar year the following graduate students have been in residence: A. F. Camp, C. C. Epling, Grace Gilmor, Adele L. Grant, Marian A. Griffiths, Mary E. Hopper, Grace E. Howard, Mildred L. Johnson, L. J. Klotz, S. G. Lehman, Christine F. Posse, Fanny Fern Smith, Louise M. Stupp, L. E. Tisdale, S. R. Warner, and H. C. Young. In addition, the research laboratories are also utilized by Dr. Joanne K. Armstrong (research assistant), Dr. G. M. Armstrong (assistant professor of botany in Washington University), Dr. G. W. Freiberg (instructor in botany in Washington University), Dr. Nellie M. Carter (research

assistant), and Mrs. Edgar Anderson (teaching fellow in Washington University), as well as by members of the staff in charge of various phases of the work.

Rufus J. Lackland Fellows.—Holders of these fellowships for the academic year 1923-24 are as follows: Carl C. Epling, A. B. University of California, instructor in botany, Oregon Agricultural College, reappointed second year; Louise M. Stupp, A. B. Washington University, assistant principal, Girard School, Girard, Illinois.

Jesse R. Barr Fellows.—Two of these fellowships are held by graduate students in botany for 1923-24: Fanny Fern Smith, A. B. Washington University; Grace Gilmor, B. S. and M. S. Wooster College, laboratory assistant, Ohio Agricultural Experiment Station, Wooster.

Teaching Fellows.—Dr. Joanne K. Armstrong, B. S. and M. S. University of Washington, Ph. D. Washington University; Mrs. Edgar Anderson, A. B. Wellesley College, assistant in genetics, Wellesley College.

Fellowship of the Crop Protection Institute.—For the second academic year one of the substantial fellowships maintained by the Crop Protection Institute under the auspices of the National Research Council has been located at the graduate laboratory of the Garden. On the vacation of this fellowship in September by H. C. Young, as noted below, the appointment was awarded to Lionel E. Tisdale, B.S. Alabama Polytechnic Institute, M.S. Michigan Agricultural College, assistant state pathologist, South Carolina Agricultural Experiment Station, formerly teaching fellow in Washington University. This fellowship was established "in order to promote original research relative to the fungicidal and insecticidal properties of sulphur."

Investigations completed by graduate students, candidates for degrees in Washington University, June, 1923, were notable in number and in scope. On June 14, the degree of Doctor of Philosophy was conferred upon the following: Arthur F. Camp, A.B. University of California, assistant in plant pathology, University of California, Lackland Research Fellow (thesis topic, "Citric Acid as a Source of Carbon for Certain Citrus Fruit-Destroying Fungi"); Adele Lewis Grant, B.S. University of California, A.M. Washington Uni-

versity, instructor in botany, Cornell University (thesis topic, "Monograph of the genus Mimulus"); Grace E. Howard, A.B. and M.S. University of Washington, graduate assistant, University of Washington, Jesse R. Barr Fellows (thesis topic, "Pigment Studies with Special Reference to Carotinoids in Fruits"); Leo J. Klotz, B.S. and M.S. Michigan Agricultural College, Lackland Research Fellow (thesis topic, "Some Aspects of Nitrogen Metabolism in Fungi"); Samuel G. Lehman, B.S. Ohio University, M.S. North Carolina State College, assistant pathologist, North Carolina Agricultural Experiment Station, Lackland Research Fellow (thesis topic, "Pod and Stem Blight of Soybean"); F. S. Wolpert, formerly Lackland Research Fellow, teacher of science, Principia School (thesis topic, "The Growth of Certain Wood-destroying Fungi in Relation to the H-ion Concentration of the Media"); and Harry C. Young, B.S. Ohio University, M.S. North Carolina State College, research assistant in plant physiology and instructor in botany, Michigan Agricultural College, Research Fellow, Crop Protection Institute (thesis topic, "The Toxic Property of Sulphur"). The degree of Master of Science was conferred upon the following: Marian A. Griffiths, B.S. University of Washington, assistant pathologist, Cereal Investigations, U. S. Department of Agriculture; and Mary E. Hopper, A.B. and A.M. Illinois College

Graduate students completing their work, as above, have received appointments as follows: A. F. Camp, plant pathologist to the Florida State Board of Agriculture and assigned to the Agricultural Experiment Station, Gainesville; Adele L. Grant returns to Cornell University as instructor in botany; Marian A. Griffiths returns to her duties as assistant pathologist, U. S. Department of Agriculture; Mary E. Hopper, assistant in botany, Barnard College, Columbia University; Grace E. Howard, instructor in botany, Wellesley College; L. J. Klotz, assistant professor of botany, University of New Hampshire; S. G. Lehman returns to the North Carolina Agricultural Experiment Station, Raleigh, as assistant plant pathologist; F. S. Wolpert continues his work as teacher in science, Principia School; and H. C. Young, chief in botany, Ohio Agricultural Experiment Station, Wooster.

HERBARIUM

The herbarium has continued a steady, normal growth during the past year. Although the total number of herbarium specimens acquired is not quite as large as it has been in some former years, yet the new material is fairly well distributed geographically and represents numerous groups of non-vascular and vascular plants. Substantial additions to the herbarium have been made from the eastern provinces of Canada, New England, the Piedmont Plateau of southeastern United States, Kentucky, Illinois, Missouri, Arkansas, the northern Rocky Mountain region, the Pacific coast states, the southwestern United States, Mexico and Central America, West Indies, northwestern South America, southeastern Europe, and China.

The congested condition of the herbarium has been somewhat relieved temporarily by the installation of several blocks of new steel cases which now accommodate the greater part of the monocotyledonous families. Additional case-capacity, however, is imperative in order that the rapidly growing collections may be properly cared for. A considerable part of the curator's time, as in previous years, has been devoted to a more thorough organization of the material on hand, so that the specimens may be more readily accessible for reference and critical study.

New Accessions.—The more noteworthy individual collections which have been added during the year are the following: Elam Bartholomew, 200 North American Uredinales; Bureau of Plant Industry, Washington, D. C., 692 fungi of the United States; B. F. Bush, 244 plants of Missouri; Botanical Garden of the University of Cluj, by Professor A. Borza, 200 plants of Roumania; Honorable Joseph R. Churchill and Walter Deane, 200 plants from the Province of Quebec, Canada, and 410 plants of Massachusetts, Connecticut, South Carolina, and Colorado; College de Longueuil, by Father M. Victorin, 190 plants of the Province of Quebec, Canada; Reverend John Davis, 476 plants of the United States; Professor J. A. Drushel, 126 plants, mostly from the eastern United States; Dr. H. A. Gleason, 1231 plants of British Guiana; Dr. J. M. Greenman, 155 plants of Illinois and Missouri, and 317 plants of Arkansas; H. C. Hanson, 261 plants of Arizona;

John H. Kellogg, 717 plants, mostly cultivated in the Missouri Botanical Garden; C. H. Knowlton, 160 plants from eastern Quebec and 165 plants of New England; Professor Frank T. McFarland, 362 plants of Kentucky; Dr. W. Migula, 150 cryptogams of Germany, Austria, and Switzerland; P. C. Standley, 220 plants of Salvador; Professor F. L. Stevens, 323 fungi of the West Indies, British Guiana, and Hawaii; United States National Museum, 1100 miscellaneous duplicates, mainly from North America and Europe, and 638 plants from Mexico and Central America; University of Montana, by Dr. J. E. Kirkwood, 300 plants of Montana; University of Nanking, 275 plants of China; University of Wyoming, by Professor E. B. Payson, 453 plants of Wyoming; S. R. Warner, 287 plants of Texas; Th. Oswald Weigel, 66 plants of Bolivia. A large number of smaller collections have been received from correspondence and friends of the Garden, which have been duly recorded in current numbers of the BULLETIN.

Mounting and Distribution.—Over 12,000 specimens have been mounted and distributed in the herbarium during the fiscal year. The specimens mounted represent mainly the plants received on current accessions, thus rendering available for immediate use the newly acquired material.

Field Work.—Noteworthy field work has been done during the year. Mr. G. H. Pring, while on his expedition to Colombia, South America, for living orchids, made a collection of ferns and flowering plants which constitute an important addition to the herbarium. Dr. J. M. Greenman, Curator of the Herbarium, in early October made a brief expedition to Arkansas collecting in Saline and Hemstead Counties, particularly in the Valley of the Red River. In addition thereto a limited amount of field work has been continued within a radius of 30 miles of St. Louis. Several local botanists and friends of the Garden have generously contributed to the herbarium local plants of special interest.

Exchanges.—An unusually large number of important series of plants has been obtained by exchange with scientific institutions with which the Garden maintains exchange relations and from individual correspondents. During the year

1255 duplicate herbarium specimens have been distributed to different herbaria.

Use of the Herbarium by outside Botanists.—Numerous visiting botanists have consulted the herbarium at various times during the year. A distinct service has been rendered to specialists in different parts of the country through the loan of herbarium specimens of special groups of plants. These loans have encouraged and furthered monographic study and have resulted in every case to a mutual advantage of all parties concerned.

Statistical Summary (For the year ending December 31, 1923).

Number of specimens received on new accessions:			
By purchase ..	**4,790**		
By gift	**1,270**		
By exchange ..	**3,764**		
By field work..	**1,502**		
By photography	**33**		
Total	**11,359**	**valued at**	**$1,135.90**
Number of specimens mounted and incorporated	12,406	valued at	$2,481.20
Number of specimens discarded from the herbarium	48	without value.	
Number of specimens in organized herbarium	900,722	valued at	$142,033.90
Number of specimens in unorganized herbarium	68,168	valued at	5,473.46
Wood specimens, etc., supplementing the herbarium		valued at	280.00
Microscope slides, etc.....		valued at	410.00
Total valuation			$148,197.36

LIBRARY

During the year 1923 there have been no changes in membership of the library staff. As in former years, the members have been employed in caring for the present contents of the library, in entering and incorporating the numerous additions of the year, and in editing and publishing the two periodicals which are maintained by the Garden for the output of its work in botanical research and horticulture.

Several hundred publications are received in serial form each year. Records have to be kept of the arrival of each part, missing parts secured promptly, all parts circulated promptly among the various research departments and then collated for the binder and finally distributed on the library shelves. Many books have been acquired by purchase and donation and many authors' separates by donation, the exact numbers of each being stated in the statistical paragraph at the end of the report.

A guide to the contents of the library has been prepared as an aid to new users of the library, and has been in satisfactory use during the latter part of the year.

From time to time, botanists have visited the library to work up or to consult the literature in their various fields. Such visitors are aided by all the facilities of the library during their stay.

During the year books were loaned by the Garden to 22 institutions for use by their investigators. Such loans are made on the interlibrary plan rather than directly to individuals. The borrower makes application for the loan through his university, which is responsible for the return of the book in good condition at the expiration of the loan and for transportation both ways.

Number 4 of Vol. IX. and Nos. 1, 2 and 3 of Vol. X. of the ANNALS OF THE MISSOURI BOTANICAL GARDEN have been published during the year. These parts contain 402 pages of text, 21 plates, and numerous text figures. The ANNALS is our principal exchange for publications of scientific societies and institutions.

The other Garden publication is the BULLETIN, of which 11 volumes of 10 numbers each have been issued. While the BULLETIN was originally intended to serve primarily as a means of informing the public as to what was of particular interest at the Garden, special attention has been given to native and exotic plants suitable for the gardens of Missouri and adjoining states. It now apparently fills a distinct need among amateur gardeners in this region. Over 50 of the articles from the BULLETIN have been republished in various horticultural journals in the last two years, and it is in increasing demand all over the United States. Visitors from the East and the West frequently ask to see some spe-

cial plant or collection which they have read about in the BULLETIN or in some publication copying our articles. During the present year Mr. Pring's account of his orchid-collecting trip in South America has been a feature of the BULLETIN.

Both the ANNALS and the BULLETIN are supplied to regular subscribers; separates of the various articles in the ANNALS are also for sale by the library. The cash receipts from such sales for the year, and for Views of the Garden, were $1940.91.

Statistical.—There have been donated to the library, or received from our correspondents during the present year, 439 volumes, valued at $975.94, and 1292 pamphlets, valued at $251.08. Three hundred and thirty-three volumes, one of them published in 1487 and the second oldest book in our library, were bought at a cost of $1556.05, and 45 pamphlets costing $29.80. The library now contains 39,951 books and 53,634 pamphlets, a total of 93,585, valued at $136,457.56. There are also 330 manuscripts, valued at $1,609.80, and 971,873 index cards, valued at $10,164.59. A total of 6915 index cards have been added during the year, of which 865 were typewritten by library employees, and 6,050 purchased at a cost of $130.06. Two hundred and sixty books were bound.

ATTENDANCE FOR THE YEAR 1923

	Week-days.	Sundays.
January	8,080	10,488
February	3,637	1,632
March	7,550	9,880
April	8,203	13,442
May	13,382	22,956
June	20,745	8,464
July	12,088	6,533
August	16,791	8,161
September	12,730	12,044
October	13,599	9,318
November	18,707	35,656
December	5,773	6,063
	141,285	144,637
		141,285
Total		285,922

Respectfully submitted,
GEORGE T. MOORE,
Director.

STATISTICAL INFORMATION FOR DECEMBER, 1923

GARDEN ATTENDANCE:

Total number of visitors	11,836

PLANT ACCESSIONS:

Total number of seed packets received as gifts	15
Total number of plants received as gifts	116

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	20
Total number of books and pamphlets donated	351

HERBARIUM ACCESSIONS:

By Gift—

Anderson, Dr. E.—*Iris versicolor* L. from Michigan	3
Anderson, Dr. E.—Plants of New Hampshire	8
Bartholomew, Elam—Fungi of Kansas	4
Charles, Vera K.—*Stereum rugosiusculum* from Spokane, Washington	1
Fric, Professor A. V.—Specimens of cacti from Mexico.	6
Fric, Professor A. V.—Photographs of cacti of Mexico..	20
Greenman, Dr. J. M.—Plants of horticulture	2
Hamby, Mrs. H. J.—Plants of Texas	5
Haynes, Miss Caroline Coventry—North American Hepaticae	45
Hibbard, Miss Ann—Fungi from Newfane, Vermont...	8

By Exchange—

Bureau of Plant Industry, Washington, D. C.—Fungi of the United States	692
Rose, Dr. J. N.—Photograph of *Astrophytum asterias* (Zucc.) Lam	1
University of Wyoming, by Dr. E. B. Payson—Plants of northwestern Wyoming	438

By Purchase

Knowlton, Clarence H.—Plants of New England	165
Leland Stanford Junior University, by Professor LeRoy Abrams—Photostatic reproductions of *Monardella*...	7
McFarland, Professor Frank T.—Plants of Kentucky..	350
Migula, Dr. W.—"Kryptogamae Germaniae, Austriae et Helvetiae exsiccatae," Fasc. 35-40 inclusive	150
University of Nanking, by A. N. Steward—Plants of China	125
Total	2030

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from November to April, 1:00 P. M. until sunset, from April to November, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director

BENJAMIN M. DUGGAR
Physiologist in charge of Graduate Laboratory

HERMANN VON SCHRENK
Pathologist

JESSE M. GREENMAN
Curator of Herbarium

EDWARD A. BURT
Mycologist and Librarian

EDGAR ANDERSON
Geneticist

JOANNE K. ARMSTRONG
Research Assistant

KATHERINE H. LEIGH
Secretary to the Director

NELL C. HORNER
Editor of Publications

G. H. PRING
Horticulturist

JOHN NOYES
Landscape Designer

P. A. KOHL
Floriculturist

EDGAR ANDERSON
In charge of School for Gardening

P. C. BRAWNER
Painter

J. CUTAK
Exotics

W. C. FAIRBANK
Plant Recorder

A. HUBER
Aquatics

J. H. KELLOGG
Herbaceous and Nursery

W. F. LANGAN
Engineer

J. LANGAN
Assistant Engineer

C. MCGOVERN
Outside Floral Display

D. MILLER
Orchids

G. NINTEMAN
Construction and Farms

J. ULRICH
Inside Floral Display

H. VALLENTINE
Carpenter

Missouri Botanical Garden Bulletin

Vol. XII FEBRUARY, 1924 No. 2

CONTENTS

	Page
Local Oaks and Their Uses	25
White-Oak Acorns as Food	32
Notes	34
Statistical Information	35

ST. LOUIS, MO.
1924

Published Monthly Except July and August by the Board of Trustees

SUBSCRIPTION PRICE:

ONE DOLLAR PER YEAR SINGLE COPIES TEN CENTS

BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

President
EDWARDS WHITAKER.

Vice-President
DAVID S. H. SMITH.

SAMUEL C. DAVIS.
EDWARD C. ELIOT.
GEORGE C. HITCHCOCK.
THOMAS S. MAFFITT.
EDWARD MALLINCKRODT.
A. C. F. MEYER.
PHILIP C. SCANLAN.
JOHN F. SHEPLEY.

EX-OFFICIO MEMBERS

HERBERT S. HADLEY,
Chancellor of Washington University

HENRY W. KIEL,
Mayor of the City of St. Louis

FREDERICK F. JOHNSON,
Bishop of the Diocese of Missouri

GEORGE T. MOORE,
President of The Academy of Science of St. Louis

HENRY A. ROSSKOPF,
President of the Board of Education of St. Louis

CHARLES A. ROE, Secretary.

LARGE SPECIMEN OF BUR OAK AT EAST PRAIRIE, MISSOURI.

Missouri Botanical Garden Bulletin

Vol. XII FEBRUARY, 1924 No. 2

LOCAL OAKS AND THEIR USES

Oaks are mentioned in the earliest histories. We are told that Absalom was caught by his hair in "the thick branches of a great oak"; and Herodotus informs us that "the first oracle was that of Dodona, set up in the celebrated oak grove of that name. There, at first, the oracles were delivered by priestesses, but, as was afterwards believed, by the inspired oaks themselves." The civic crown, given in the palmy days of Rome to the most celebrated men, was composed of oak leaves. The oak was the symbol of Baal or Yiaoul (whence Yule), the god of fire, and at his festival, which was at Christmas, the ceremony of kindling the Yule log was performed by the Druids. This fire was kept burning throughout the year, and the hearths of all the people were annually lighted from these sacred fires every Christmas. The curious custom of kindling the Yule log with much rejoicing at Christmas time is supposed to be still extant in some parts of England. Acorns, the fruit of the oak, appear to have been held in considerable estimation as an article of food among the ancients, as well as among the aborigines of the New World. Not only were the swine fattened upon them, as in our own forests, but they were ground into flour with which bread was made by the poorer classes.

The Arcadians believed the oak to have been the first created of all trees; and when we consider its great utility and beauty we are disposed to give it first rank among forest trees. The wood of the oak has, since ancient times, held a preeminent place in house-, ship-, and bridge-building, because

of its durability, strength, and toughness. It is also extensively used in the manufacture of furniture and carriages, being especially adapted to high-grade work, also in cooperage. The bark is rich in tannin and is used for the tanning of leather. The bark of some of the European species produces the cork of commerce. The galls which are caused by the stings of insects are also rich in tannin and have been used in the manufacture of writing ink.

Oaks are extremely valuable as ornamentals in landscape work, being regarded by many as the most varied and the most beautiful and picturesque of all deciduous trees. They are not easily transplanted from their native locations in the woods, owing to the formation of a tap-root very early in life, but if properly handled in the nursery, with early removal of the tap-root and frequent transplanting to prevent the formation of a new tap-root before being planted in their permanent place, most of them can be moved with ease. Oaks are not well adapted to the smoky atmosphere of cities.

The genus Quercus which consists almost entirely of large trees comprises about three-hundred species throughout the world. About fifty of these are native to America, half of them distributed in the eastern states and half on the western slopes. No Pacific-coast species are found naturally in the eastern states and no eastern species across the Rocky Mountains.

Our local oaks may be classified into two general groups:

1. THE WHITE-OAK GROUP

Acorns ripening in one season; lobes of leaves rounded; bark pale and often scaly.

Quercus alba (white oak).—The white oak is the most valuable of our local oaks, though rather slow in growth. Locally it attains a height of about 100 feet with a trunk diameter of about 6 feet. When grown in the open it generally divides near the ground in a great many lateral branches, forming a wide irregular crown. It grows in any ordinary good soil regardless of exposure. It is easily distinguished from other local oaks by its grayish white bark which is broken up into loose scales, and by its leaves, which are round-lobed, smooth

and pale on their under surface when mature, and often persist over winter. The wood is strong and very hard, tough, close-grained, and durable, and is used extensively in shipbuilding, in the manufacture of carriages, agricultural implements, railway ties, baskets, in fences, interior finish, cabinet making, cooperage, and for fuel. A decoction of the inner bark has been employed medicinally in cases of hemorrhage and dysentery. The white oak is a fine tree for ornamental planting where it can be given sufficient room for development.

Habitat: dry upland woods, Maine to Ontario, Minnesota and southward.

Quercus stellata (post oak).—The wood of the post oak closely resembles that of the white oak and is used for the same purposes, although considered inferior. It is a smaller tree than the white oak, its maximum height not exceeding 60 feet, with a trunk diameter of 3 feet. It forms a dense, broad, round-topped crown, with wide-spreading branches. The post oak may be distinguished from the other oaks by the peculiar form of its leaves which have 3 large terminal lobes and 1 basal lobe, making them wedge-shaped in outline. The upper surface of the leaves is shiny, bright green, the lower surface pale and covered with a rusty pubescence. The buds are more reddish in color than those of the white oak. The post oak will grow in poorer soil than the white oak and is generally found on dry flats and hills.

Habitat: Pennsylvania to Kansas, south to Florida and Texas.

Quercus alba × *stellata* (hybrid oak).—One tree near Allenton, Mo. In every respect intermediate between the parents.

Quercus lyrata (swamp post oak).—A large tree with a symmetrical round head and small pendulous branches. The maximum height is from 70 to 100 feet, and the trunk diameter is about 3½ feet. The leaves are bright green and shiny above, white-downy beneath, turning scarlet and orange in autumn, obovate, narrowed at the base, with 3–5 pairs of lobes. This species is easily recognized by its button-like acorns which are usually completely covered by the cup. The wood is hard, strong, tough, and durable, and is used for the same purposes as the white oak.

Habitat: wet bottom-land, Maryland to Florida, west to Missouri and Texas.

Quercus macrocarpa (bur oak).—This is the largest of our native oaks, usually attaining a height of from 90 to 100 feet, occasionally 150 feet, with a trunk diameter of 7 feet. It has broad, spreading branches if grown in the open. Its wood is particularly adapted for quarter-sawing on account of its conspicuous medullary rays, and is considered even better than white oak if grown in rich soil. Commercially it is used for the same purposes as the white oak.

The bur oak is the most picturesque American oak as well as the most ornamental. It is comparatively easily transplanted when young, and its adaptability to different regions and climates is remarkable, growing in the forests of Canada, in the moist climate of New England, and in the hot arid regions of Texas. It is the most rapid-growing of the white-oak group and more resistant to a smoky atmosphere than any other oak. It may be recognized by its unique leaves which have deep rounded sinuses that reach nearly to the midribs and divide the leaves almost into 2 parts. The pubescence on the lower side of the leaves and corky projections on the young branches are also characteristic, as are the large-fringed acorn cups and the persistent leaves. The bark is grayish brown, deeply furrowed, becoming scaly.

One of the largest trees in the vicinity of St. Louis is located at East Prairie, Missouri. This giant species stands about 130 feet in height, and the circumference, measured 3 feet from the ground, is 23 feet. These measurements and photograph reproduced in plate 2 were obtained through the courtesy of Mr. R. A. Doyle, of East Prairie, Missouri.

Habitat: rich moist soil, Nova Scotia to Montana, south to Pennsylvania, Tennessee, and Texas.

Quercus macrocarpa var. *olivaeformis* (bur oak variety).—This variety is like the bur oak, except that the leaves are narrower and the acorns smaller and cylindrical.

Quercus bicolor (swamp white oak).—A picturesque tree which in the open develops an open round-topped crown with the upper branches ascending and the lower drooping. Locally, the maximum height is 60-70 feet and the trunk diameter 2–3 feet. This oak may be distinguished by the leaves,

the sinuses of which are shallow and give the leaf a broad appearance, by the bark on the younger branches which peels off into thin, large plates, as in the sycamore, and by the long-stalked acorns, about one-third of which is enclosed by the cups. The wood is used commercially for the same purposes as the white oak. The swamp white oak is a picturesque tree for waterside planting and does well in any rich moist soil.

Habitat: swamps, Maine to southern Iowa, south to Maryland, Kentucky and Arkansas.

Quercus Muhlenbergii (chinquapin or yellow oak).—This oak, locally, sometimes attains a height of 75 feet and a trunk diameter of 3 feet, but it is usually smaller. Its lateral branches are relatively short, forming a narrow, round-topped crown. The leaves are oblong to lanceolate, equally and rather sharply toothed, closely resembling those of the chestnut. The bark is thick, rough, fissured into long irregular ridges which break up into grayish or brownish scales. The wood is not equal in importance to that of the white oak but is utilized for similar purposes. This is a good tree for ornamental planting, but it is of rather slow growth.

Habitat: limestone glades and rich north hillsides, Vermont to Delaware, along the mountains to Alabama, west to Minnesota, Nebraska and Texas.

2. THE BLACK-OAK GROUP

Acorns requiring two seasons in which to mature; lobes of leaves bristle-pointed; bark usually dark and furrowed.

Quercus rubra (red oak).—The red oak usually attains a height of from 70 to 90 feet, with a trunk diameter of 3-4 feet, but occasionally it grows to 150 feet with a trunk diameter of 5 feet. When grown in the open it has a short trunk and a broad symmetrical crown. It may be recognized by the flat-topped ridges of the bark, its straight-ascending clean branches, its dull green leaves with red midribs, its light reddish inner bark, its large acorns with broad yellow cups, borne in pairs on short stalks, and its smooth, sharp-pointed, light brown buds. The red oak is the most rapid grower of all the oaks. It is desirable for ornamental planting on this account, also because of its smooth bark, straight branches,

and the color of its foliage, the rosy pink of early spring changing to a dark dull green at maturity and into orange and brown in autumn. This oak is highly prized as an ornamental tree in Europe, particularly England, Belgium, and Germany. It is commercially inferior to the white oak, but is extensively used in cooperage, cheap furniture, construction, and interior finish of buildings. The bark is rich in tannin.

Habitat: rich soil, Nova Scotia to Minnesota, south to Georgia, Tennessee and Kansas.

Quercus Schneckii (Schneck's oak).—This species closely resembles the red oak, but the sinuses of the leaves are deeper and the acorns are pointed.

Habitat: Indiana, Iowa to Texas and Florida.

Quercus palustris (pin oak).—The pin oak usually attains a height of from 70 to 100 feet with a trunk diameter of 3–4 feet. It may easily be recognized by its characteristic form, the trunk being straight and continuous, relatively smooth, the crown symmetrical, conical, the lower lateral branches smooth and drooping, the middle horizontal, and the upper ascending. As the lower branches die, they leave a hard peg or pin which penetrates to the heart-wood, hence the name pin oak. This is not a very valuable species commercially, but it is used in construction, cooperage, interior finish, and for shingles. It is extremely useful in ornamental planting and is extensively used as an avenue tree. The leaves turn to brilliant scarlet in autumn. It is a comparatively fast grower and will grow in any rich, moderately moist soil.

Habitat: swamps, Massachusetts to Michigan and Missouri, south to Tennessee and Oklahoma.

Quercus coccinea (scarlet oak).—This is a beautiful tree which locally attains a height of 50 feet, with a trunk diameter of 2½ feet, but which in favorable localities may reach a height of 150 feet with a diameter of 4 feet. It is slender and symmetrical, the branches and twigs gracefully curving to form a conical and comparatively narrow head. The leaves are oval or obovate, with 5–7 spreading and subdivided lobes, with deep, rounded sinuses and slender long petioles, smooth and shining above, bright red at the time of unfolding, bright green at maturity, and brilliant scarlet in autumn. The bark

on the old trunks is broken up into rough irregular fissures. The inner bark is red to gray. The wood is not of great commercial importance, but the tree is one of the most desirable of the oaks for street and park planting because of its rapid growth and attractive foliage.

Habitat: dry soil, Maine to Minnesota, south to North Carolina, Illinois and Missouri.

Quercus velutina (black oak).—The black oak, locally, attains a height of 75 feet, with a trunk diameter of 3½ feet, but elsewhere within its range it reaches a height of 150 feet with a trunk diameter of 4½ feet. The crown is comparatively narrow and round-topped. The branches are rather stout and zigzag. The leaves are very variable, no other oak producing so many different shapes on the same tree. The mature leaves are dark green above and pale to yellowish green beneath, with tufts of brownish hairs in the axils of the veins and midribs. The dark-colored and rough outer bark and the yellow inner bark are distinctive characteristics of this species. The wood is durable and is used for furniture and interior finish, cheap cooperage, and general construction. The black oak is not easily transplanted and is not as attractive for ornamental purposes as other oaks.

Habitat: dry sterile soil, Maine to western Ontario, south to Florida and Texas.

Quercus marilandica (black jack).—The maximum height of this species is 60 feet, with a trunk diameter of 2 feet. The crown is usually compact, the branches short, the upper ascending and the lower spreading, making the tree narrow and round-topped. The leaf is broad towards the apex, ending in 3 or more distinct lobes of variable size and form, pear-shaped in outline, leathery in texture, set with rough stellate hairs. This species is of no particular value except for fire wood and fence posts.

Habitat: poor sterile soil, New York to Pennsylvania, west to Nebraska, south to Florida and Texas.

Quercus imbricaria (shingle oak).—The maximum height of the shingle oak, locally, is 60-75 feet, with a trunk diameter of 3 feet. The crown is open, with the lateral branches drooping. This species may be easily recognized by its oblong, entire, shiny, dark green leaves which are pale and

hairy beneath. It is not of much value commercially but is a valuable and beautiful tree for ornamental planting. The straight-grained wood is easily split for shingle-making, hence the popular name.

Habitat: dry flats, poor soil, Pennsylvania to Michigan and Nebraska, south to Georgia and Arkansas.

WHITE-OAK ACORNS AS FOOD

One of the principal foods of the North American Indians was meal made from white-oak acorns. Unlike turkey, squash, tobacco, and Indian corn, this food has never become popular with the white man and is seldom heard of to-day, though our white oaks continue to yield heavy crops and the few remaining Indians from Wisconsin to Washington still make use of them. The process of manufacture varied with the different tribes and with the species of oak from which the acorns were taken. The following dispatch from a Washington paper describes the process still in use by the Klickitat Indians of the Pacific coast:

"The Klickitat Indian acorn harvest has begun.

"The acorns, as gathered, are preserved for future use in peculiar storing places called Chuck-ahs. These are large baskets of long willow sprouts closely woven, six feet high and three in diameter. They are set upon stone and stick platforms several feet from the ground. They are well braced and the outsides of the baskets are coated with pine boughs laid point downward to shed off rain and snow. The pine needles also keep out squirrels and woodpeckers. As the baskets are filled, bark roofs are constructed to tightly cover them. When the acorns are desired, a hole is made in the bottom of the baskets so that they can roll out.

"The acorns are bitter and cannot be eaten in their natural state. When properly cooked and prepared they are palatable. The first hull is cracked and removed when the kernel is pounded or ground to fine meal. Soft sand stone mortars once were used for grinding, but now modern equipment is in the possession of every family. After grinding, the next process is removal of the bitter tannin. The Indian chief makes a long, shallow basin in clean washed sand in which are laid a few flat, fern-like ends of fir boughs.

"Small stones, heated white hot, are placed into kettles of water. The water so heated is mixed with acorn meal to a consistency of porridge. This mixture is emptied into sanded moulds, and as the hot water runs out into the sand it carries away the substance

WHITE-OAK ACORNS USED IN MAKING MEAL.

MUFFINS MADE FROM ACORN MEAL.

causing the bitter taste. The meal then is washed clean of sand and worked into dough. The pasty cakes are baked flat, and when cooked possess the oily taste of peanut butter."

The Indians of Massachusetts parched the fresh acorns and stored them in that condition. The early records of the Pilgrims tell of the discovery, during their first hard winter, of such a store buried in baskets in the ground. The meal was used in various ways. Probably the commonest was to make it into hoe cakes which were baked in the ashes, but the Indians of the Great Lakes region boiled it as a mush, usually combined with maple sugar and often with the further addition of venison.

With a modern kitchen equipment the acorn meal can easily be prepared at home. After husking the acorns they should be ground in a hand-grist mill or food-chopper. The meal is then mixed with hot water and poured into a jelly bag. The bitter tannin, being soluble, will be taken out by the water, but sometimes a second or even third washing may be necessary. After washing, the wet meal is spread out to dry and then parched in an oven. If it has caked badly it should be run through the mill again before using.

In cooking, acorn meal may be used in the same way as corn meal. Its greatest fault is its color, muffins made from it being a dark chocolate brown. The taste suggests a mixture of cornmeal and peanut butter, and some people relish it at once, but others, it must be confessed, have to be educated to it. Because of the high oil and starch content of the acorn, it is very nutritious and is reported to be easily digested. Only acorns from white oaks should be gathered, as those from the black oaks are too bitter. The white oaks have flaky gray bark and leaves which are not spine-tipped. Typical Missouri representatives of this group are the white oak, the swamp oak, the bur oak, and the chestnut oak. The small pile of acorns shown in plate 3 made nearly two quarts of meal.

NOTES

Mr. G. H. Pring, Horticulturist to the Garden, has given his lecture "Collecting Orchids in South America," before the following audiences recently: the museum section of the Academy of Science, at the Jefferson Memorial, January 16; the Scottish Rite Club, at the American Annex, January 22; the Parent-Teacher Association of the William Stix School, February 12; the Rose Fanning School Patrons Association, February 15; the Men's Club of the Church of the Redeemer, at the Parish House, February 20; the pupils of the Clifton Heights School, February 21.

Recent visitors to the Garden include Prof. George B. Rigg, professor of plant physiology, University of Washington, and Prof. John T. Buchholz, professor of botany, University of Arkansas, December 30; Prof. E. G. Kelly, professor of entomology, Kansas Agricultural College, Prof. E. A. Stokdyk, associate professor of plant pathology, and Dr. S. M. Zeller, associate research professor of plant pathology, Oregon Agricultural College, January 3; Mr. A. C. Burrage, of Boston, president of the Massachusetts Horticultural Society, and one of the largest growers of orchids in the United States, January 26; and Mr. A. V. Fric, of Prag, Czechoslovakia, who is returning from an extensive collecting expedition in Mexico.

STATISTICAL INFORMATION FOR JANUARY, 1924

GARDEN ATTENDANCE:

Total number of visitors	7,191

PLANT ACCESSIONS:

Total number of seed packets received as gifts	8
Total number of plants received as gifts	85

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	36
Total number of books and pamphlets donated	82

HERBARIUM ACCESSIONS:

By Gift—

Anderson, Dr. E.—Specimens of *Iris*	2
Baxter, Dow V.—Fungi of Michigan	7
Munz, Prof. P. A.—*Senecio occidentalis* (Gray) Greene from California	1
Trelease, Prof. Wm.—Fruit of *Agave Letonae*, Trelease from Salvador	1

By Purchase—

Bartholomew, Elam—North American Uredinales, Cent. 30, Nos. 2901-3000; Cent. 31, Nos. 3001-3100	200
University of Nanking—Plants of China	332

By Exchange—

Drushel, Prof. J. A.—Plants of Vermont, New York, Wisconsin, Missouri and California	17
Noé, Prof. A. C.—Plants of Mont Athos, Greece	88
Total	648

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director

BENJAMIN M. DUGGAR
Physiologist in charge of Graduate Laboratory

HERMANN VON SCHRENK
Pathologist

JESSE M. GREENMAN
Curator of Herbarium

EDWARD A. BURT
Mycologist and Librarian

EDGAR ANDERSON
Geneticist

JOANNE K. ARMSTRONG
Research Assistant

KATHERINE H. LEIGH
Secretary to the Director

NELL C. HORNER
Editor of Publications

G. H. PRING
Horticulturist

JOHN NOYES
Landscape Designer

PAUL A. KOHL
Floriculturist

EDGAR ANDERSON
In charge of School for Gardening

P. C. BRAWNER
Painter

J. CUTAK
Exotics

W. C. FAIRBANK
Plant Recorder

A. HUBER
Aquatics

J. H. KELLOGG
Herbaceous and Nursery

W. F. LANGAN
Engineer

J. LANGAN
Assistant Engineer

C. MCGOVERN
Outside Floral Display

D. MILLER
Orchids

G. NINTEMAN
Construction and Farms

J. ULRICH
Inside Floral Display

H. VALLENTINE
Carpenter

Missouri Botanical Garden Bulletin

Vol. XII MARCH, 1924 No. 3

CONTENTS

	Page
Frozen Hedges and Roses and Their Treatment	37
Rabbits that Bark	40
Eremurus for St. Louis	41
Notes	43
Statistical Information	44

ST. LOUIS, MO.
1924

Published Monthly Except July and August by the Board of Trustees

SUBSCRIPTION PRICE:

ONE DOLLAR PER YEAR SINGLE COPIES TEN CENTS

BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

President

EDWARDS WHITAKER.

Vice-President

DAVID S. H. SMITH.

SAMUEL C. DAVIS.

EDWARD C. ELIOT.

GEORGE C. HITCHCOCK.

THOMAS S. MAFFITT.

EDWARD MALLINCKRODT.

A. C. F. MEYER.

PHILIP C. SCANLAN.

JOHN F. SHEPLEY.

***EX-OFFICIO* MEMBERS**

HERBERT S. HADLEY,
Chancellor of Washington University

FREDERICK F. JOHNSON,
Bishop of the Diocese of Missouri

HENRY W. KIEL,
Mayor of the City of St. Louis

GEORGE T. MOORE,
President of The Academy of Science of St. Louis

HENRY A. ROSSKOPF,
President of the Board of Education of St. Louis

CHARLES A. ROE, Secretary.

PRUNING THE CALIFORNIA PRIVET AT THE GARDEN.

Missouri Botanical Garden Bulletin

Vol. XII MARCH, 1924 No. 3

FROZEN HEDGES AND ROSES AND THEIR TREATMENT

When plants are damaged by some unusual insect pest, disease or mechanical injury, and the damage is widespread, the Garden is always asked for a statement concerning such injury. This winter the California privet *(Ligustrum ovalifolium)* has, in most places, been frozen, and numerous inquiries as to what to do have been received at the Garden. Some of these hedges have already been cut down to the ground, and the owners of similar hedges have been wondering whether theirs should be cut also or whether theirs were hardier and not in need of such drastic treatment. The purpose of this article is to describe the injury to the California privet and roses during the past season and to suggest treatment.

When the word hedge is used one generally thinks of the California privet. This is because in St. Louis and vicinity this privet has been planted almost exclusively for hedge purposes. It thrives in practically all soils; the smoke does not affect it; and it is fairly hardy. The number of years intervening between killing freezes is usually sufficient to cause most people to forget that California privet will not live through every winter without injury. These hedges have not been frozen back for about seven years, but this year they suffered greatly. The freezing back is not always due to the low temperature alone but to the suddenness or unusual conditions attending the cold spell. The mild weather of December, 1923, caused the sap of most plants to be active. The last

Sunday in December was unusually mild; the sun was bright and people paraded without overcoats as on the finest spring day. However, six days later the thermometer had dropped from over 70 degrees in the sun to 11 degrees below zero, a fall in temperature of 81 degrees in a few days. To make matters worse, the earth was not protected by a blanket of snow and the cold was ushered in with a high wind. It is the combination of severe cold, high wind, no protection, and a bright sun that does so much damage. Naturally, only the very hardy plants can survive such extremes. As the California privet cannot be classed as absolutely hardy it must suffer occasionally, but for this particular plant the freezing, in some cases, is beneficial.

By constant shearing privet hedges are frequently kept at the same height every year. Very few new shoots can come up from the base due to the lack of light caused by the existing growth, and weak and stubby plants are the result. Some hedges should be severely cut back occasionally to encourage new growth, but this treatment is seldom practised. As most of the privet has been frozen this year it is necessary that it be cut down to the ground as shown in plate 4. If no large pruning shears are available the plants can be sawed off, but hand shears should not be used as the thick wood will seriously damage the blades. In some protected places hedges might have survived the cold or, as occasionally happens, some plants in a hedge will have been frozen and others not. In the latter case one is tempted to allow the hedge to stand in the hope that all the plants will come back to life, but such a practice results in an uneven hedge and it is better to cut all the plants entirely back. Fortunately for the California privet the roots are seldom frozen and even though the hedge is cut to the ground it is a rapidly growing plant and a uniform stand always results.

How to know when a plant is frozen is a question frequently asked. Frozen branches turn brown and black and are shriveled. These conditions are not so evident on thin wood, but if the stem is alive the wood is green beneath the surface, while frozen or dead wood is brown through and through.

There are other privets useful for hedges that are more

hardy than the common privet but they will probably never replace the California variety. The latter has much to recommend it, since it is cheap, grows quickly under adverse soil and city conditions, and can stand much abuse. Among the hardier privets may be mentioned *Ligustrum Ibota* and *Ligustrum amurense*, and some hybrid ligustrums. The hybrid known as the "Ibolium" privet, which is said to be a cross between *Ligustrum ovalifolium* and *Ligustrum Ibota*, proved to be hardy this winter. A hedge plant that is being distributed this season recommended to take the place of the box *(Buxus sempervirens)* when that admirable plant cannot be used, is "Lodense" privet. This is quite dwarf and said to be hardy. Another plant which has much to recommend it for hedges in place of the common privet is the barberry *(Berberis Thunbergii)*. Its thorns are an advantage in that they prevent trespassers from injuring the hedge. In the fall the leaves turn reddish brown and during the greater part of the autumn and winter the brilliant red berries are a pleasing sight. With the dust and smoke of the city, however, this color soon disappears. Perhaps the only disadvantage of this hedge is that it is a slow grower and seldom exceeds four feet in height. On the other hand, it does not need to be pruned as frequently as the California privet, and it is really better if the shears are not used except to keep the hedge even across the top.

Inquiries are also received about pruning roses. This is the first time in a number of years that the roses were so frozen that many of the canes were split to the base. The sudden cold caused the sap to freeze and expand, thereby splitting the bark. In such cases the canes must be cut off at the base. Dead and frozen branches of roses are easily recognized by their brown and shriveled appearance. The buds are much larger than on the hedge plants and if still alive are quite plump. The middle of March is about the best time to prune roses, before the buds have broken through their coverings, but if the weather remains cold and all plant life is quite dormant pruning should be delayed until such time as growth commences. Too early pruning sometimes means double work, as the plants must be gone over a second time if a severe late freeze kills back the canes. On the other

hand, to let the roses start and then cut off the canes full of sap is detrimental, as much of the sap and energy that has gone into these cut-off buds could have been saved and diverted into those buds that are to remain. Rugosas, native roses, hybrid perpetuals, polyanthas, and climbers can be pruned earlier, as these withstand the occasional freezes better if growth has not progressed too far. The teas and hybrid teas should be pruned last. The climbers should ordinarily not be pruned at this time, but this year some of them have numerous canes that were entirely frozen and these of course should be removed at the base. Other shoots that have been killed back should be cut to the live wood. It hardly seems necessary to call attention to the fact that in pruning roses the cut should be made above a live bud which, when it grows, will produce a shoot that goes out from the plant and not across the center of it. The pruning of rose bushes should be so regulated that the center of the plant is open to light and air.

A widespread impression is that a plant that does not have the dead wood removed, or a hedge that is not cut down will die at the roots. This is not true. The only reason for pruning and removing dead wood is to improve the appearance of the plant and to prevent such dead wood from interfering with the new growth that might spring from the base.

RABBITS THAT BARK

This odd title attracts attention, and yet it is no more striking than the damage rabbits can do to small trees and shrubs during the winter months when other food is frozen or covered with snow (pl. 5).

Rabbits are known to damage young trees and shrubs every year, the amount of damage varying from season to season with the weather and the number of rabbits. Due to the grading of the tract of land at the Garden which formerly was covered with farm crops and low brush, the wild life has been forced into the main garden. While the actual number of rabbits is not very great, they have been doing considerable damage. Experimental plots of winter wheat have been cut to the ground, and during the recent cold spell many ornamental plants were damaged. On account of the negligible

PRUNUS MAHALEB, SHOWING BARK DAMAGED BY RABBITS

CREATURES AT THE GARDEN

amount of snow in recent years, traps are almost useless, since rabbits cannot be tracked. While rabbits attack many plants, at times they prefer certain kinds, as in this case the row of *Prunus Mahaleb* in the nursery which was damaged during the cold spell of January 5. A few well-directed shots would soon dispose of these rodents, but in the city that is not the safest method.

What should be done to plants injured by rabbits? If properly taken care of, most wounds will heal by callusing. In the case of shrubs the damaged wood can be removed if the injury is not too general, but trees that have one main trunk must be treated. Damage is sometimes confined only to one side of the trunk, and in such instances the remaining uninjured tissue is sufficient for the sap to flow through. The frayed edges in wounds of this sort should be cut to a smooth edge and the entire wound covered over with grafting wax, or wax and cloth, to exclude moisture and prevent fungus spores from entering. The cloth also prevents the wound from drying out in extremely hot weather. The wax is prepared by heating in a vessel one part tallow, two parts beeswax, and four parts rosin. When melted, the mixture is poured into cold water and then pulled until it assumes a light cream color. Occasional greasing of the hands while pulling will prevent the wax from sticking. Trunks of large diameter can be repaired by bridge grafting if the wound girdles the trunk or if sufficiently large to demand such treatment. Trees and shrubs that are severely damaged should be pruned back so as to prevent too active growth. While sufficient moisture could be supplied, if the wood is not seriously damaged, the downward flow of the sap will be interfered with until the injured portion is again healed.

When the number of ornamental plants on a place is not very great and the damage by rabbits and mice is anticipated, it is well to place some wire netting, to a height of about eighteen inches, about the stems of such plants.

EREMURUS FOR ST. LOUIS

Because of notable introductions from Asia by Russian botanists and travelers within the last decade, the genus Eremurus has occupied a prominent place in European gar-

dening magazines, although it is generally conceded that the plants are not easily established. In the spring of 1920 several hundred roots of *Eremurus robustus* were imported from Europe for trial at the Missouri Botanical Garden. Since the plants require a fairly sunny location with not too much moisture, they were placed in the Crataegus border surrounding the rose garden. No special preparation of the soil was necessary but the roots were planted about one foot deep to retard as much as possible the early spring growth. The greatest difficulty in St. Louis is to keep the flower stalks from being injured by late frost, and it is often necessary to protect them with leaves or straw. During an ordinary spring the growth is very rapid and not infrequently the plants are a foot or more above ground before the time when they are safe from a killing frost. This growth appears as a dense head of leaves inclosing the flowering spike, and unless protection is given the top of the spike is apt to be frosted, resulting in a deformed flower head. Despite the protection given at the Garden twenty-five per cent of the flower spikes have been nipped. However, the results obtained have made it well worth while growing this striking plant.

Care must be used in giving winter protection, but since this is dependent upon the weather no definite rule can be given. If the ground is open and the weather is warm, a mulch will tend to excite growth at a time when it is not desired. Cover should only be applied when the ground is frozen, usually about the first of January, but in this matter the grower must judge for himself.

The roots of Eremurus are unusual in their formation, the octopus-like, fleshy, tubers radiating in clusters from a central base or crown from which the growth emerges. The long leaves appear in early spring, forming a dense rosette somewhat resembling the native yucca when open. The flowers are small and star-shaped, in dense clusters upon poker-like spikes reaching over eight feet in height (pl. 6). The basal flowers open first, the color, according to the species, being white, pink, or yellow. The tall spikes may need some support to protect them from windstorms, but the stake should be kept as far from the plant as possible to avoid injuring the succulent roots. During July the leaves start to wither and soon

go down. If transplanting is necessary it should be accomplished during this period.

The plants may also be raised from seed if one has the patience to wait five years or more for flowering plants. For the first two years the small fleshy roots go straight down, later assuming their normal habit of radiating from the central crown. New annual roots are formed during this seedling stage, the old ones decaying, but with age the same roots are maintained from year to year and often extend to a length of two or more feet from the crown.

European gardeners vary in their opinion regarding the transplanting of established plants, some advocating annual removal, while others recommend this process every three years. The plants at the Garden have not been moved since the original planting in 1920 and the results have shown annual improvement. In fact, they have only been cultivated at regular intervals throughout the summer, as with ordinary perennials. While there are many hardy perennials difficult to grow in the middle west, some hardly worth the care and attention given them, to be the possessor of an established Eremurus collection is well worth the effort required. There are upwards of twenty known species of these semi-hardy plants and when in bloom they present a beautiful sight, towering above the other perennials.

NOTES

Dr. Hermann von Schrenk, Pathologist to the Garden, gave an address on "Forestry in Missouri" before the Daughters of the American Revolution, March 5.

Dr. George T. Moore, Director of the Garden, broadcasted a talk on "The Black Smoke Tax" from the Stix, Baer & Fuller radio station, March 7.

Mr. G. H. Pring, Horticulturist to the Garden, spoke before the St. Louis Flower Show Association banquet at the Jefferson Hotel, February 28, on "Cooperation by the Garden with Local Flower Shows."

Mr. John Noyes, Landscape Designer to the Garden, attended a meeting of the Mississippi Valley Chapter of the

American Society of Landscape Architects at Des Moines, February 22-23.

Mr. G. H. Pring, Horticulturist to the Garden, has recently given his lecture, "Collecting Orchids in South America", before the following audiences: the pupils of the Rose Fanning School, February 27; Collinsville Study Club, Collinsville, Ill., March 4; before the pupils of the Cleveland High School, March 11; Kennard School Patrons' Association, March 14; Shenandoah School Patrons' Association, March 17.

STATISTICAL INFORMATION FOR FEBRUARY, 1924

GARDEN ATTENDANCE:

Total number of visitors	9,477

PLANT ACCESSIONS:

Total number of seed packets received as gifts	21
Total number of plants received as gifts	174

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	33
Total number of books and pamphlets donated	91

HERBARIUM ACCESSIONS:

By Gift—

Carpenter, Mrs. G. O.—Photograph of *Acacia Koa* A. Gray from the Island of Kanai, Hawaiian Islands	1
Kauffman, Dr. C. H.—Wyoming fungi	5
Long, Dr. W. H.—*Stereum sanguinolentum* on ties from New Mexico	1
Yasuda, Dr. A.—Fungi of Japan	15

By Purchase—

Broadway, W. E.—Plants of Trinidad, British West Indies	100

By Exchange—

Drushel, Prof. J. A.—Plants of Vermont, Missouri and Colorado	18
Yasuda, Dr. A.—Fungi of Japan	8
Total	148

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director

BENJAMIN M. DUGGAR
Physiologist in charge of Graduate Laboratory

HERMANN VON SCHRENK
Pathologist

JESSE M. GREENMAN
Curator of Herbarium

EDWARD A. BURT
Mycologist and Librarian

EDGAR ANDERSON
Geneticist

JOANNE K. ARMSTRONG
Research Assistant

KATHERINE H. LEIGH
Secretary to the Director

NELL C. HORNER
Editor of Publications

G. H. PRING
Horticulturist

JOHN NOYES
Landscape Designer

PAUL A. KOHL
Floriculturist

EDGAR ANDERSON
In charge of School for Gardening

P. C. BRAWNER
Painter

J. CUTAK
Exotics

W. C. FAIRBANK
Plant Recorder

A. HUBER
Aquatics

J. H. KELLOGG
Herbaceous and Nursery

W. F. LANGAN
Engineer

J. LANGAN
Assistant Engineer

C. MCGOVERN
Outside Floral Display

D. MILLER
Orchids

G. NINTEMAN
Construction and Farms

J. ULRICH
Inside Floral Display

H. VALLENTINE
Carpenter

MISSOURI BOTANICAL GARDEN BULLETIN

Vol. XII APRIL, 1924 No. 4

CONTENTS

	Page
Forcing Grapes	45
Poisoning Caused by Eating Daffodil Bulbs	52
A New White Orchid from Panama	53
Notes	54
Statistical Information	56

ST. LOUIS, MO.
1924

Published Monthly Except July and August by the Board of Trustees

SUBSCRIPTION PRICE:

ONE DOLLAR PER YEAR SINGLE COPIES TEN CENTS

BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

President

EDWARDS WHITAKER.

Vice-President

DAVID S. H. SMITH.

SAMUEL C. DAVIS.

EDWARD C. ELIOT.

GEORGE C. HITCHCOCK.

THOMAS S. MAFFITT.

EDWARD MALLINCKRODT.

A. C. F. MEYER.

PHILIP C. SCANLAN.

JOHN F. SHEPLEY.

EX-OFFICIO MEMBERS

HERBERT S. HADLEY,
Chancellor of Washington University

FREDERICK F. JOHNSON,
Bishop of the Diocese of Missouri

HENRY W. KIEL,
Mayor of the City of St. Louis

GEORGE T. MOORE,
President of The Academy of Science of St. Louis

HENRY A. ROSSKOPF,
President of the Board of Education of St. Louis

CHARLES A. ROE, Secretary.

NOVEL NESTING PLACE OF A HOUSE WREN.
(Photographed at the country place of Mrs. S. W. Fordyce.)

Missouri Botanical Garden Bulletin

Vol. XII APRIL, 1924 No. 4

FORCING GRAPES

One of the most attractive greenhouses at the Garden is the forced-fruit house when the peaches, nectarines, and grapes are either in bloom or in fruit. After the removal of the azaleas, rhododendrons, and ericas several years ago from this house to their permanent location in the Linnean house, the house was devoted to the growing of grapes, peaches, cherries, and nectarines. Here, along each side of the house, are to be found such varieties of grapes as Muscat of Alexandria, Foster's Seedling, Madresfield Court, Buckland Sweetwater, Gros Colman, Black Hamburg, and Lady Downes. Through the center of the house the peaches, nectarines, and cherries are trained to the wire supports, and these will be made the subject of a subsequent article.

Just forty years ago Mr. Henry Shaw compiled from various sources a small book which was printed under the title "The Vine and Civilization." Practically all of the work is given up to a discussion of the various kinds of wine, and some interesting comparisons are drawn between the advanced state of civilization of those people who use wine, as contrasted with those who fail to grow this fruit and to use the drink which it produces. The theory is advanced that wine-producing countries are the most favored of God's creation and wine drinkers the most temperate of men. The degree of the civilization of a people is always in proportion to the quality and temperate use of the wine they consume.

There is also a brief account of the vine, from which the following excerpts are taken:

"Of the vine, its fruit, and the wine made from it, the

writer proposes to give a brief history, drawn from various authorities.

"The vine is universally known for its fruit, and for producing the first liquor of the world; a liquor, notwithstanding all that is said of its dangerous qualities, that is yet eagerly drank by all who can procure it, and preferred before all others by those who are unlimited in their means and choice. The Grape is, among fruits, what wheat is among cereals, or the potato among farinaceous roots; and like them, in every country where it will grow, is cultivated with pre-eminent care.

"The use of the vine is from remote antiquity, and often mentioned in Holy Writ. Noah planted a vineyard after the deluge, and made wine from the grapes (Gen. ix. 20, 21). The vine was known to the Egyptians and is represented on their monuments (as the writer has seen it pictured in the tombs of the kings at Thebes in Upper Egypt, of a date many centuries before the Christian era). The Israelites, in their journey through the wilderness, longed for the vines of Egypt (Numb. xx. 5).

"Vineyards abounded in Canaan when the Israelites took possession of it and in Syria at the present day clusters weighing ten and twelve pounds have been gathered. Frequent allusions are made in the Bible to vineyards, to vine-dressers, to rejoicings at the vintage, the gathering and gleaning of the grapes, the treading of the grapes, the wine-presses and the wine-vats—all indicating the important place which the vine occupied among the productions of Palestine. Israel is represented as a vine brought from Egypt and planted by the Lord. Dwelling under the vine and fig tree is an emblem of peace and tranquility (Zac. iii. 10).

"In Grecian mythology Bacchus, to whom more temples have been erected than to any other deity, is said in ancient times to have brought the vine from India, where the cultivation in modern times has become neglected. The vine, a migratory climber, which has run around the globe, twined high in man's affections, and made surprising inroads on his pocket, has several disputed birthplaces. According to the legends, Africa owed it to Osiris, and Europe to Bacchus. The Jews claimed it for the slopes of Mt. Hebron. Its birth-

BLACK HAMBURG GRAPE.

FOSTER'S SEEDLING.

place was perhaps that same Persian paradise that produced the fig, the peach, and the apricot.

"Alexander the Great found the wild vine on the banks of the Hydaspes in northern India. The mountains of Fer-distan, in Persia, probably supplied the vines which were first cultivated by man; the wine of Shirez is made from vines growing on those hills."

According to European experts the two best varieties of the grape are Black Hamburg and Muscat of Alexandria, and this has proved to be the case in St. Louis. These two varieties ripen their fruit before the other varieties in the same house, and in other ways as well are more satisfactory. Other standard varieties of repute are Foster's Seedling (white) originated about 1836, but not becoming popular until twenty years later. Gros Maroc (black) was introduced about 1855 by M. Vibert of Angers. This variety, like its predecessor, was little grown for a number of years until T. H. Rivers exhibited specimens at the Royal Horticultural Society of England. From this time it held its place in all fruit exhibitions. The same may be said of Gros Colman, Mr. Thomson of Scotland being the first to recognize its possibilities and to grow it on a large scale for market. As grown at the Garden it is the latest variety, producing usually large colored fruit.

Grape vines properly cared for live for an indefinite period. One of the oldest existing vines is the notable plant at Hampton Court Palace, London, England. It was planted during 1769 in a small greenhouse and as the plant increased in size the house was rebuilt in proportion. At the present time the main trunk is almost two feet in diameter, and its roots have ramified through the ground to a considerable distance; in fact it has been reported they have reached the River Thames in the vicinity. The plant is in perfect health, attested to by the fact that many hundreds of bunches of grapes are produced annually.

While forcing fruit in greenhouses is widely practiced on the large private estates in the East, in this part of the country it is seldom resorted to. The quality of fruit grown under glass is frequently superior to that of outdoor cultivation, and forced grapes may be purchased on the New York market, which were grown in the London district or even farther away. In planning a grapery, the style of house is

important, the most satisfactory for this climate being the curvilinear type. In size it should not exceed thirty feet in width, the length being governed by the number of vines required. The house should run north and south so as to obtain all possible light for ripening the fruit. Complete ventilation is essential, combined with perfect drainage.

CULTIVATION.

The "outside border" planting as practiced in England has produced excellent crops but this system is not applicable to St. Louis because of the hard freezes which may occur. In this climate the vines should be planted inside the house. However, openings in the foundation below the frost line which will permit the stronger-growing roots to ramify to the exterior is sometimes advantageous. This double rooting area is said to prolong the vigor of the plant. The outside border apparently is more suitable for the vine roots, the strongest roots not infrequently being found on the exterior, while the roots on the inside show signs of decay during the resting period. Unless there is perfect drainage in the house, as upon elevated ground, four-inch drain pipe should be installed about four feet below grade. These should be combined with broken bricks or additional drain-pipe in order to prevent, as far as possible, the clogging of the drain by roots.

Grape vines do not require any particular soil mixture, but will adapt themselves to most soils. A good rose soil is quite satisfactory. Experts give preference to sod soil from pasture land. When preparing the soil, as much fibrous material should be incorporated as possible, cutting the sod in convenient size for handling and laying the grass side down. The width of the bed should be between six and eight feet. The cultural directions for grapes vary more than for any other fruit and date back for a hundred years or more.

Where a succession of fruit is required, the grapery should be divided by glass partitions into sections and planted with early, mid-season, and late varieties. The early crop should be started in December, the mid-season the first week in February, and the late vines in April, if weather will permit. When starting the vines the temperature should be gradually

increased from 45° to 50° F. at night and 10 degrees higher during the day until the maximum of 70° at night and 80° during the day is reached. Sudden changes in temperature will promote mildew, as well as check the growth and fruit. When artificial heat is discontinued similar troubles appear if the house is kept tightly closed. Vines enjoy fresh air combined with a humid atmosphere and ventilation should be given, avoiding direct drafts.

When starting into growth the plants should be sprayed several times during the day up to the time of flowering. During this period water should be withheld from the foliage so as not to interfere with pollination. After the setting of the fruit overhead spraying may be resumed, but it should be reduced to a minimum when the fruit begin to show color; otherwise the fruit will become spotted. Ordinarily, vines are rank feeders, responding with maximum fruit production when fertilizers are applied. Potash is the most essential for fruit development and is frequently applied in the form of nitrate of potash. Wood-ashes and bone-meal are likewise beneficial, especially if mixed with the soil when the bed is under construction. For local application when the vines are established organic fertilizer in the form of cow manure is most commonly used, being applied first when the grapes are thinned and again after they have passed their stoning period or when the fruit begins to swell. Many so-called grape fertilizers are on the market, but the grower must learn from experience which to use, as much depends upon the nature of the original soil.

An important factor controlling crop production is correct pruning. There are two systems of pruning in general practice, the spur system and the long-rod system. The spur system is the one usually adopted in this country. The young canes, the first season, are cut back to about one foot above ground. The following season they are pruned to about four feet, the subsequent cutting of the terminal depending upon the desired height of the vine. This may seem a rather drastic method, but it is necessary in order to produce strong growth for future development. The interspacing of the spurs or lateral shoots should be about fifteen inches apart so as to permit east training along the supporting wires or trellis. In pruning the lateral dormant shoots they should be cut back

to short spurs, leaving one or two good eyes, the strongest being selected for fruit development. This cutting back to short spurs is just the opposite practice of pruning other fruits, due to the fact that the grape is borne only on new wood. The long-rod system is advocated primarily for the shy-fruiting varieties and where very large individual bunches are desired. The method is entirely different, inasmuch as a new cane is used annually. This is selected from a strong basal shoot, which is trained to bear the succeeding year's fruit, cutting away the previous year's fruiting cane. By this system all second-year wood is eliminated.

Prior to starting the vines the house should be thoroughly cleansed and fumigated with hydrocyanic gas. The canes should be freed from loose bark to permit free ingress of gas, thus destroying any hibernating insects. After cutting back the lateral shoots to short spurs, the cane should be laid down. This is to retard the flow of sap and prevent the terminal shoots breaking into growth before the lower spurs, which would be the case were the canes immediately tied in their permanent position. After the spur growth is equalized the canes are tied into place. The next operation is selecting the strongest brakes, rubbing off the undesirable shoots with the finger or thumb. When the new growth is about a foot long the vines should be tied carefully to their supports, leaving plenty of room for expansion. Do not attempt to tie into position too early, as the shoots may break when bending them down into position. Pinching or "stopping" of the shoots is necessary to avoid excessive growth at the expense of the fruit, the number of bunches allowed depending upon the age and size of the present cane. Overcropping is a mistake and the correct number of bunches to mature should be given careful consideration. When the grapes begin to show color all pinching should be discontinued, otherwise coloration is affected and occasionally cracked fruit will result. If the shoots have been kept well under control, very little growth is made at this time.

The ease with which the fruit sets depends largely upon the variety. Some varieties will show uneven swelling, due to imperfect pollination, and in such cases artificial pollination must be resorted to. During this process the atmosphere and the plant should be kept dry. When the grapes are about the

size of a small pea they should be thinned out, eliminating the innermost grapes to permit the full expansion of a well-balanced bunch. The tendency in most cases is to underthin. However, with experience, the grower can readily judge the number to thin out. This operation is usually accomplished with the aid of a forked stick to steady the bunch while the undesirable grapes are cut out with special grape-thinning scissors. Care should be taken to avoid touching the grapes with the fingers, for if the glaucous covering is rubbed off, the fruit is spoiled for commercial use.

CONTROL OF INSECT AND FUNGOUS PESTS.

Mealy Bug.—Usually present under the bark. Treat the dormant vines with wood alcohol, removing loose bark.

Red Spider.—This is one of the worst pests, occurring upon both the leaves and fruit. If unable to control by forcible spraying, regulation of temperature, and ventilation, spray with nicotine or use powdered tobacco.

Thrips.—Punctures the surface of the leaves and tender shoots and sucks the juices. Spray with nicotine or dust with tobacco.

Vine weevil.—Feeds upon the leaves, leaving small holes. Control by hand-picking or hydrocyanic-gas fumigation; also by spreading cloth under the vines and collecting the weevils after shaking the vines.

Mildew.—Causes the skin of the fruit to harden, thus checking development; also discolors the leaves. Sudden drafts and a drop in temperature induces this disease and should be avoided. Sulphur fumigation.

Rust.—Appears upon the fruit after thinning. Said to be due to handling the fruit during this operation.

BEST VARIETIES FOR FORCING.

Early.—Black Hamburg, Appley Towers, Madresfield Court, Foster's Seedling, Buckland Sweetwater, Royton Muscat.

Mid-season.—Muscat of Alexandria.

Late.—Black Alicante, Alnwick Seedling, Gros Guillaume (also called Barbarossa), Gros Maroc, Gros Colman, Lady Hutt, Madresfield Court (both late and early variety).

POISONING CAUSED BY EATING DAFFODIL BULBS

The various representatives of daffodils and jonquils have long been recognized as possessing a toxic principle, the so-called "narcissine" which, if taken into the system, may cause acute symptoms of poisoning. Authentic cases of poisoning from such cases are, however, rare, and consequently the one recently reported at a meeting of the Edinburgh Pharmaceutical Society is of interest.

Mr. Thomas Wilson here related the experience of four persons who were boarding in a private residence and who decided to prepare their own meal. The person about to make a stew was advised where the vegetables were kept and took what she presumed to be an onion. It was, however, a bulb of a narcissus. The stew was prepared and seasoned with the supposed onion and when served was partaken of by five adults. Before the meal was ended the five persons were seized with fits of vomiting and shivering and suffered from intense gastro-enteritis. After a few hours all had apparently recovered and there seemed to be no ill after-effects. Had the usual quantity of onions been used in the preparation of the meal the results would have undoubtedly been more serious.

It seems almost incredible that narcissus bulbs could be mistaken for onions, since, of course, there is an entire absence of the characteristic onion odor, and the typical watering of the eyes which accompanies the preparation of onions is likewise lacking. After the bulbs have sprouted the flat leaf of the narcissus is another point which distinguishes it from the tubular foliage of the onion. Since cases of poisoning occur in spite of these differences, it would seem to be desirable that care be taken in storing daffodils and similar bulbs away from vegetables which are to be used in cooking. It is likewise a possibility that in digging onions in a garden where daffodils are growing one or more of these poisonous bulbs might be included with the onion bulbs.

The case above referred to is not an isolated one, as other experiences have been reported where whole families have suffered severely from mistaking daffodil bulbs for onion bulbs. Attention should therefore be called to the poisonous property of these bulbs, since it does not seem to be generally known.

TRICHOPILIA SUAVIS.

TRICHOPILIA SUAVIS VAR. ALBA.

A NEW WHITE ORCHID FROM PANAMA

Of the many Panamanian orchids presented to the Garden by Mr. C. W. Powell of Balboa, during the recent orchid expedition, the trichopilias were the most showy. Upwards of a hundred recently collected plants of this genus were being established in Mr. Powell's garden, and while examining these specimens he held up a coveted plant, remarking, "This is a pure albino variety. I will give you a piece for your collection in St. Louis. I feel sure that it will represent the only living specimen of its variety in the United States. I also have a rarer variety recently collected by myself, *Trichopilia marginata* var. *alba*. I will give you a piece of this rare variety also."

The genus Trichopilia includes over twenty species indigenous from Mexico to South America, most of them being only of botanical importance. The handsomest species is represented by *Trichopilia suavis*, the flowers of which may be compared to a small cattleya. Its growth, however, is entirely different, the flowers being produced from the base, whereas the flower spikes of the cattleyas are terminal.

Inasmuch as the plants possess plump pseudobulbs they shipped well from the tropics and upon arrival in St. Louis of the plants from Mr. Powell they soon started to make their growth, establishing themselves within a few weeks. After making their growth most of the plants showed flowers, among which was the albino variety. The type species (plate 10) has a labellum with a beautiful mauve, spotted throat, the depth of color varying with the different plants. *Trichopilia suavis* var. *alba* (plate 11) has white sepals and petals, the labellum likewise being white suffused with yellow in its throat.

In Panama the plants grow upon the trees in the crotches and upon the branches, forming large clumps. The pseudobulbs are crowded together on short rhizomes, ovate and compressed, bearing short elongated or lanceolate leaves six to ten inches long, one to each bulb, erect, prominently keeled. The flowers are white with a mauve-spotted lip, the white form being suffused with yellow. They are produced upon short, more or less procumbent scapes bearing two or four flowers.

NOTES

Dr. Hermann von Schrenk, Pathologist to the Garden, was elected president of the Missouri Forestry Association, March 21.

Dr. Hermann von Schrenk delivered an address at the University of Wisconsin, March 19, on "Timber as an Engineering Material."

The hail storm on the night of April 9 broke one thousand panes of glass in the Garden greenhouses, necessitating closing the houses for two days to allow clearing the roofs of hanging glass.

Dr. Edgar Anderson, Geneticist and in Charge of School for Gardening, is the author of a paper in the January number of *Genetics*, entitled "The Genetic Basis of Self-Sterility in Nicotiana."

Dr. Edgar Anderson talked before the Scoutmasters of the Central District, St. Louis, April 15, on "Nature Study;" and on April 17 gave an illustrated lecture before the conservation section of the General Federation of Women's Clubs, at the Chamber of Commerce, on "Native Wild Flowers of Garden Value."

Recent visitors to the Garden include Mr. E. J. Palmer, of the Arnold Arboretum; Mr. W. W. Ashe, of the United States Forestry Service, and Dr. L. J. Pammel, professor of botany, Iowa State College, Ames, Iowa.

On the afternoon of April 17 the senior class of the St. Louis School of Pharmacy planted a red oak tree, with appropriate ceremonies, in the medicinal garden at the Garden. In view of the fact that Mr. Shaw was one of the founders of the School of Pharmacy, this was a particularly fitting occasion.

Dr. George T. Moore, Director of the Garden, gave an illustrated lecture before the Women's Chamber of Commerce, at a luncheon at the Washington Hotel, April 3, on "Lawns and Spring Gardens;" and in the evening spoke before the first annual convention of the American Association of Oil Burner Manufacturers at the Hotel Chase, on "Measurement and Menace of Smoke."

Mr. G. H. Pring, Horticulturist to the Garden, has recently given the illustrated lecture, "Collecting Orchids in South

America,'' before the following audiences: March 24, Sutton School Parent-Teachers' Association, and the pupils of the Kennard School; April 8, Grant School Patrons' Association; April 10, Cleveland High School Parent-Teachers' Association; April 11, Buder School Patrons' Association and Clifton Heights Mothers' Circle; April 14, Good Will Club banquet at the Claridge Hotel.

Professor Jean Massart, visiting professor to America under the Educational Foundation established by the Commission for Relief in Belgium, delivered a lecture in the lecture room at the Garden on Saturday afternoon, March 29, on ''Reflexes of Fungi.'' Professor Massart is the author of many papers on botanical subjects and has an international reputation as a botanist. He is professor of botany at the University of Brussels and a member of many prominent scientific organizations of Belgium and France.

Dr. B. M. Duggar, Physiologist to the Garden, who is on a six-months leave of absence to carry on research work at Johns Hopkins University, has given the following lectures at Baltimore: March 10, before the Society for Hygiene, ''The Toxicity of Sulphur;'' February 11, before the staff and graduate students in medical zoology, Johns Hopkins University, ''The Present Status of Virus Diseases of Plants;'' March 13, before the Journal Club in Medical Zoology, ''Hydrogen-Ion Concentration, a Factor in Absorption and Metabolism;'' April 3, before the Biological Journal Club, ''Filterable Viruses;'' April 10, before the seminar of medical zoology, Johns Hopkins School of Hygiene, ''Parasitism Among Fungi.''

STATISTICAL INFORMATION FOR MARCH, 1924

GARDEN ATTENDANCE:

Total number of visitors	7,893

PLANT ACCESSIONS:

Total number of seed packets received in exchange	222

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	98
Total number of books and pamphlets donated	157

HERBARIUM ACCESSIONS:

By Gift—

Ashe, W. W.—Types and critical specimens of southern woody plants	21
Ball, Dr. C. R.—Plants of North Dakota, South Dakota, Idaho, and Oregon	9
Fawcett, Dr. H. S.—Root fungus of orange trees	1
Fuller, Prof. George D.—Plants of Starved Rock, State Park, Illinois	218
Posse, Miss Christine—Microscopic preparations of gymnosperms	12
Pring, George H.—*Trichopilia suavis* var. *alba*	1
Sherff, Dr. Earl E.—Photographs of *Bidens triplinervia* var. *macrantha* (Wedd.) Sherff	1
van der Bijl, Prof. P. A.—Fungi of Cape Colony, Africa.	18
Wilson, Prof. G. W.—*Exobasidium Vaccinii* on *Arctostaphylos* from Colorado	1

By Purchase—

Arnold Arboretum, Harvard University—Woody plants of North America, collected by E. J. Palmer	786
Bush, B. F.—Plants of Missouri	265
Dusen, P.—Plants of Brazil	313
Gleason, Dr. H. A.—Plants of British Guiana	700

By Exchange—

Drushel, Prof. J. A.—Plants of New York, Ohio, Missouri, and Colorado	7
Gray Herbarium, Harvard University, by Professor M. L. Fernald—Plants of Gaspé, Quebec, Canada	75
Field Museum of Natural History—Plants of Peru	28
Total	2,456

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director

BENJAMIN M. DUGGAR
Physiologist in charge of Graduate Laboratory

HERMANN VON SCHRENK
Pathologist

JESSE M. GREENMAN
Curator of Herbarium

EDWARD A. BURT
Mycologist and Librarian

EDGAR ANDERSON
Geneticist

JOANNE K. ARMSTRONG
Research Assistant

KATHERINE H. LEIGH
Secretary to the Director

NELL C. HORNER
Editor of Publications

G. H. PRING
Horticulturist

JOHN NOYES
Landscape Designer

PAUL A. KOHL
Floriculturist

EDGAR ANDERSON
In charge of School for Gardening

P. C. BRAWNER
Painter

J. CUTAK
Exotics

W. C. FAIRBANK
Plant Recorder

A. HUBER
Aquatics

J. H. KELLOGG
Herbaceous and Nursery

W. F. LANGAN
Engineer

J. LANGAN
Assistant Engineer

C. MCGOVERN
Outside Floral Display

D. MILLER
Orchids

G. NINTEMAN
Construction and Farms

J. ULRICH
Inside Floral Display

H. VALLENTINE
Carpenter

Missouri Botanical Garden Bulletin

Vol. XII MAY, 1924 No. 5

CONTENTS

	Page
Forcing Peaches and Nectarines	57
The First Exhibition of the American Orchid Society	61
The Maidenhair Tree	64
Notes	65
Statistical Information	66

ST. LOUIS, MO.
1924

Published Monthly Except July and August by the Board of Trustees

SUBSCRIPTION PRICE:

ONE DOLLAR PER YEAR SINGLE COPIES TEN CENTS

BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

President
EDWARDS WHITAKER.

Vice-President
DAVID S. H. SMITH.

SAMUEL C. DAVIS.
EDWARD C. ELIOT.
GEORGE C. HITCHCOCK.
THOMAS S. MAFFITT.
EDWARD MALLINCKRODT.
A. C. F. MEYER.
PHILIP C. SCANLAN.
JOHN F. SHEPLEY.

EX-OFFICIO MEMBERS

HERBERT S. HADLEY,
Chancellor of Washington University

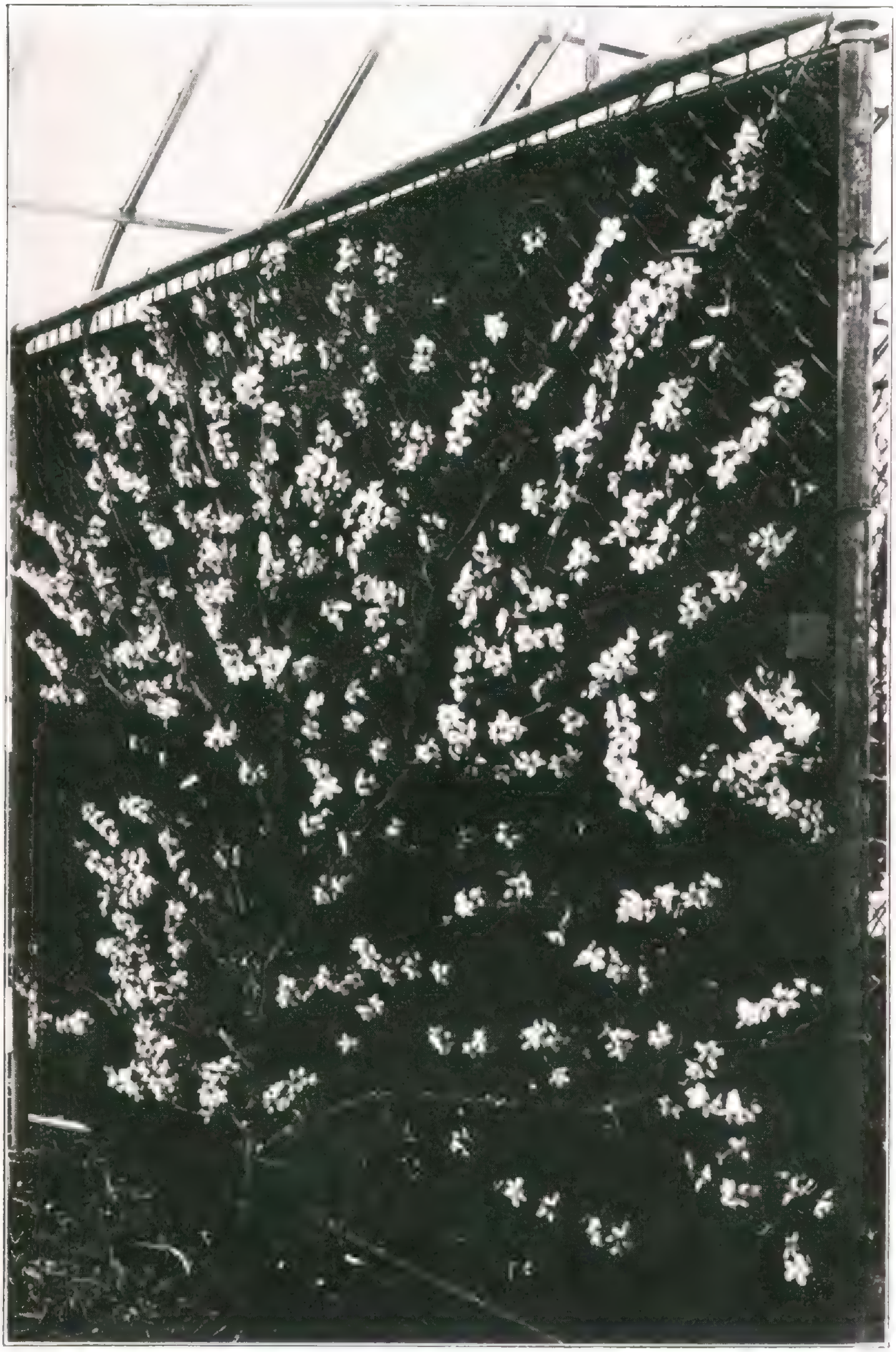
HENRY W. KIEL,
Mayor of the City of St. Louis

FREDERICK F. JOHNSON,
Bishop of the Diocese of Missouri

GEORGE T. MOORE,
President of The Academy of Science of St. Louis

HENRY A. ROSSKOPF,
President of the Board of Education of St. Louis

CHARLES A. ROE, Secretary.



NECTARINE "STANWICK."

Missouri Botanical Garden Bulletin

Vol. XII MAY, 1924 No. 5

FORCING PEACHES AND NECTARINES

Although the common peach (*Prunus Persica*) was once thought to have originated in Persia and will probably always carry in its name record of this mistake, it is now known to be a native of China and is a true species. The nectarine (*Prunus Persica* var. *nucipersica*), which is distinguished from the peach by its smooth skin and the more strongly serrate leaves, is said to have originated from the peach through both seed and bud variation. The nectarine is not generally cultivated in the middle west, but in California, where the climate is more stable, it is grown in all parts of the state. As in the peach, there are two types, the cling- and free-stone varieties. When grown outdoors the flavor of the fruit does not compare with that grown under glass.

In England and other sections of Europe having a cool climate it is possible to grow nectarines only when trained against a wall with southern exposure and even then winter protection is necessary. The American tourist often mistakes the almond tree, frequently planted in gardens, for the peach. Both peaches and nectarines are well adapted to greenhouse cultivation and are grown under glass to a considerable extent in Europe, trained to espaliers. Since they yield annual crops, they are popular with owners of private estates.

Improved varieties of both peaches and nectarines have been produced by planting seeds of either type resulting from hand pollination. Favorable results have also been obtained by intercrossing the peach with the nectarine, one of the best midseason peaches, "Peregrine", being the result of a cross with the nectarine, "Spencer". To offset the

work of the peach borer, which is most troublesome when forcing these fruits under glass, they should be budded upon plum stock which is immune to the peach borer. Forced peaches and nectarines may be brought into fruit during May and continued until the outdoor crop is in season, providing sufficient houses and varieties are at one's disposal.

Various types of houses may be used, such as the lean-to, the three-quarter span, and the even span. In a lean-to the plants should be trained to the wall facing south so as to obtain all possible sunshine and warmth. In a three-quarter span they should be trained up under the glass. The even-span house is by far the best, since here the plants may be either trained up under the glass or upon espaliers through the middle of the house. This latter method produces by far the best results from the standpoint of crop production, since the plants obtain all the sunshine that is available and accessibility to all sides of the plant makes insect control possible. A greenhouse twenty-five feet wide, the length being governed by the number of plants to be grown, is most convenient. The supports or trellises should be eighteen feet wide, allowing a space of three feet on each side for walks and steam pipes.

Despite the fact that peaches require an abundance of water during the growing season, they do not thrive in heavy soil, but prefer a sandy or medium loamy soil, which suggests that they are sensitive to poor drainage. Therefore in preparing the peach bed it is necessary to guard against souring of the soil, otherwise root decomposition will affect both the foliage of the trees and flavor of the fruit. The soil should not be too rich, on account of the rapidity of growth of young wood during the first season. Slowly acting fertilizers, such as half-inch bone, may be added in the proportion of one part to fifty parts of soil. Later, potash and hard-wood ashes may be used as a top dressing and cultivated into the soil. Where humus is lacking farmyard manure may be applied as a top dressing. Excellent temporary results have been obtained from borders three feet wide and only one and a half feet deep. It is much safer, however, in order to insure permanent annual crops, to extend the depth to three or even four feet in order to guard against the drying out of the roots which ramify the soil.

NECTARINE "EARLY RIVERS."

Peaches and nectarines may be planted after defoliation either in spring or fall. Fall planting is to be preferred in order that the plants may become established before starting to grow. However, when planted in the spring a crop may be produced the first season. In either case the plants should be thoroughly watered and mulched to conserve moisture. The soil, even in the resting season, should not be permitted to become dry; otherwise the dormant buds will drop off when root action starts. Newly planted stock should not be forced before the first of February, but established plants may be started after the middle of September, in a temperature of 48° F. at night and 50–55° F. during the day. Within ten days as the buds show development, the temperature may be increased to 50° F. at night and 60–65° F. during the day, allowing 70° F. for sun heat, the latter being controlled by ventilation. During the flowering season in early February the atmosphere should be kept fairly dry to facilitate pollination. Pollination is usually accomplished by using a rabbit's foot or tail on a handle and dusting across the open flowers. With the setting of the fruit the temperature may be increased to its maximum of 60° F. at night and 75° F. during the day. After the fruit is permanently set, and weather permitting, the foliage may be sprayed several times throughout the day. The soil should be soaked so thoroughly that it will not dry out for several days. The systematic use of fertilizers throughout the entire season is an important factor in producing the maximum amount of fruit. A light top dressing of cow manure should be given when the plants are started. This should be followed with periodical applications of bone-meal, hard-wood ashes, and potash. Overfeeding will manifest itself in the form of brittle leaves.

The fruit is formed upon spurs of the previous year's growth. Careful disbudding and training are necessary; otherwise the growth will soon become too crowded and result in "blind wood", or the development of wood buds instead of fruiting spurs. To avoid checking the plants surplus shoots should be removed periodically and not all at one time. Disbudding may be started when the shoots are about a half inch long. Thinning of fruit is essential, since overcropping will result in small fruit which lack flavor.

Start thinning when the young fruits are the size of a hazel nut and repeat the process when they have reached the size of a walnut. Between these periods a certain amount of sterile fruit will drop off so the grower must judge the amount of pruning accordingly. In order to retain its flavor and rich aroma the ripe fruit should be gathered when it is highly colored. Both peaches and nectarines are so-called "heavy croppers". A conservative estimate for a specimen plant covering a space 10 x 18 feet is 200 fruits.

After cropping, the plants demand the same constant attention. The soil should be kept cultivated and a light fertilizer applied. The foliage should be sprayed several times a day to control red spider, mealy-bug, and aphids, and if necessary the house should be fumigated with hydrocyanic gas. With the approach of fall the watering should be gradually reduced and finally entirely withheld to ripen and harden the wood and assist defoliation. Remove all old or superfluous wood to make room for training the previously selected new fruiting branches. It is not necessary to pinch or stop these remaining shoots but they should be allowed full development, tying and training them about six inches apart.

While the plants are resting winter pruning may be attended to, the object being to conserve the greatest amount of fruiting wood and to provide space for young wood which will bear the future crop. The grower should be able to distinguish the wood bud from the fruit bud, shape being the most easily recognized characteristic. The wood bud has a conical, pointed appearance, whereas the fruit bud is much larger and more rotund. In pruning, the tree should be loosened from its supporting trellis and if unbalanced it may be pruned into shape. In making a cut care should be taken to cut back to a wood eye, not a spur, otherwise the plant will invariably die back to a wood bud, leaving dead wood in view during the growing season. For all purposes the fan-shape is considered most convenient. If too rank a growth is apparent it sometimes becomes necessary to prune the roots, which is accomplished by shortening the strongest roots, or by digging a trench three or four feet distant around the tree and cutting the strongest roots with a knife. This will influence the fibrous roots, essential in fruit develop-

ment. The best time for root pruning is immediately before defoliation. Young plants may be held in check or controlled by this method, and it is advisable to do this to aid in the development of lateral branches.

CONTROL OF INSECTS AND DISEASE.

San Jose Scale.—Fumigate when plants are dormant, with hydrocyanic gas.

Peach Borer.—A whitish larva about three-quarters of an inch long when mature, which bores into the crown and upper roots, causing exudation of gum. It must be dug out, after which apply gas tar or coal tar around the basal portion of the trunk or lower branches. This latter remedy is, however, more for outside protection than inside. Also use hydrocyanic gas fumigation if possible.

Green Fly.—Troublesome upon the young foliage, especially at the time when fruit is setting. The grower is somewhat handicapped at this time by his inability to spray until after the setting of the fruit. Spray as soon as possible with nicotine, or fumigate.

Red Spider.—Fumigation or forcible spraying after setting of fruit.

THE FIRST EXHIBITION OF THE AMERICAN ORCHID SOCIETY

The first exhibition of the American Orchid Society, held in Horticultural Hall, Boston, Massachusetts, May 8–11, was an event which marked an epoch in the annals of American orchidology. The thousands of flowering orchids brought to the hall far exceeded the expectations of the members of the Society. With the exception of one small lot from England and the collection sent by the Missouri Botanical Garden all the exhibits were from the immediate vicinity of Boston, the home of the first cultivated orchid in America.

The success of the show was due largely to the efforts of Mr. Albert C. Burrage, the president of the Society. His exhibits comprised nearly two-thirds of the total display, filling the large hall. Mr. Burrage paid particular attention to the native environment of the orchid and as far as possible staged his plants according to their geographical dis-

tribution. South America was represented by a rocky ledge towering some fifty feet high. From the top flowed a stream which was directed in such a manner as to form a series of cascades, suggesting the scenery of Tequendama Falls in the region of the Andes of Bogota. Various other tropical plants were associated with the orchids, such as tree ferns, aroids, mosses, etc. Joining this exhibit was a low bog rock garden in which were growing the North American orchids of the lady-slipper variety. The Philippines were suggested by a native hut of the thatched type built upon stilts, hanging from the roof and sides of which were the famiilar native moth orchids in white and mauve shades. Surrounding the huts were trees covered with epiphytic orchids indigenous to the islands. Towering above these were fruiting cocoanut palms. For the Florida exhibit native trees with their attached epiphytes were shipped from the south.

The smaller hall was devoted to the private and commercial exhibits. Twice the amount of space could have been used to advantage by all the individual exhibitors. The central feature staged by Mr. F. E. Dixon, of Elkins Park, Pennsylvania, was an orchid arbor made up of a great variety of exceptionally fine plants. Around the sides of the hall the various commercial and private exhibits were displayed, either banked almost to the ceiling in various designs or, for natural effects, fastened upon trees.

The hybrid orchids exceeded by far those of type species, notable being the Laelio-Cattleyas, Brasso-Cattleyas, and Brasso-Laelio-Cattleyas. The cool-house orchids (which, unfortunately, cannot be grown in St. Louis) were shown in great numbers, particularly *Odontoglossum crispum* with its many varieties. It was interesting to see the bigeneric hybrid between Odontoglossum and Cochlioda known as Odontioda. The Miltonias, especially specimens of *M. vexillaria,* with their mauve pansy-like flowers, showed a wealth of spikes. The hybrid Cymbidiums, particularly those showing the mauve color, were well represented. These terrestrial plants are fast becoming popular on account of the lasting qualities of the spikes when cut.

One entire room was devoted to displaying a part of the fine collection of books and paintings of orchids belonging to Mr. Burrage. This exhibit attracted much attention.

There were also shown some of the unexcelled photographs of native orchids taken by Mr. Lincoln, and Mr. Oakes Ames exhibited some beautiful paintings of Cypripediums. Altogether, it would be hard to conceive of a more complete and satisfactory first attempt on the part of the American Orchid Society to present the magnificence and beauty of this unique group of plants.

The exhibit sent from the Garden did not comprise the showy hybrids but a collection of botanical interest. Thirty-seven distinct genera, representing forty-six species (all that could be included in the requisite twenty-five square feet), were selected, many of which were collected on the recent expedition into South America and are new to this country. For this exhibit, which was in competition, the Garden was awarded a silver cup. A collection of slipper orchids of the mosaic-leaf type was also shipped, but the trip was too long for the flowers to last in perfect form and some of them were broken in transit. A set of colored photographs illustrating the collecting and transportation of orchids from South America for the Garden was likewise shown. A silver medal was awarded for this exhibit.

LIST OF ORCHIDS SHOWN IN COMPETITION "OF BOTANICAL INTEREST, NOT NECESSARILY IN FLOWER, COVERING 25 SQUARE FEET AND EMBRACING AT LEAST 12 GENERA"

Aspasia epidendroides
Aspasia Rousseauae
Bifrenaria Harrisoniae
Brassavola tuberculata
Bulbophyllum Cassiopeia
Camaridium affine
Camaridium latifolium
Campylocentrum peniculus
Chondrorhyncha Lipscombia
Chysis bractescens
Coelia Baueriana
Coelogyne Dayana
Coelogyne Parishii
Coryanthes macrantha
Dichaea panamensis
Encyclia atro-purpurea var. *rhodoglossa*
Epidendrum eburneum
Epidendrum odoratissimum
Epidendrum sp.
Eria gigantea
Gongora tricolor
Hartwegia purpurea
Hexisea bidentata
Lockhartia pallida
Maxillaria aciantha
Megaclinium colubrinum
Notylia pentachne
Odontoglossum pulchellum
Oncidium ampliatum
Oncidium divaricatum
Oncidium Kramerianum
Oncidium Oerstedii var. *crispiflorum*

Oncidium stipitatum
Ornithidium sophronitis
Ornithocephalus diceras
Phalaenopsis Lueddemanniana
Pholidota chinensis
Polystachya panamensis
Rodriguezia sp.
Scaphyglottis prolifera
Spathoglottis aureo-Vieillardii
Stanhopea bucephalus var. *guttata.*
Trichopilia marginata
Trigonidium Seemannii
Warscewiczella discolor
Xylobium stachyobiorum

THE MAIDENHAIR TREE

The maidenhair tree (*Ginkgo biloba*) is the only survivor of an extensive family of plants of a prehistoric period. While it has been introduced into Europe and America from China and Japan, it is not known to be growing indigenous or in a wild state anywhere.

It is a stately tree which at maturity reaches a height of 100 feet, with a cylindric, slightly tapering trunk, usually slender when young, the branches becoming massive, ascending or more or less spreading when older. The leaves are wedge-shaped, deciduous, resembling those of the maidenhair fern (*Adiantum*), striated on both sides with numerous parallel veins, bright grass-green when young, dull rich green at maturity, and turning a clear bright yellow before they fall. The flowers are dioecious, the male catkins slender and stalked, the females on long footstalks, in pairs, of which generally only one persists. The fruit is a drupe, consisting of an acrid, ill-smelling pulp surrounding a smooth oval, cream-colored, thin-shelled nut with a sweet kernel.

The fertilization of the flowers of this tree is unusual and interesting. The flowers appear in April or the beginning of May, and the pollen is distributed by the wind and settles on the tip of the female flower. Fertilization takes place in September, through the fusion of a motile male sperm from the pollen with an egg cell in the female flower. The development of the embryo takes place when the seed is full grown and ready to fall, sometimes even after the seed had already fallen to the ground. The offensive odor of the fleshy covering of the seed is caused by a fatty acid which is called ginkgoic acid. A full description of the ginkgo was given in the October, 1914, number of the BULLETIN,

MAIDENHAIR TREE IN FRUIT AT THE GARDEN

accompanied with a photograph of a tree in full foliage. The photograph accompanying this article shows an unusual abundance of fruit on a tree in the Garden this autumn.

NOTES

Dr. Nellie Carter, Research Assistant at the Garden, is the editor of Volume V of West's "Algae" recently issued by the Ray Society of London, England.

Dr. Hermann von Schrenk, Pathologist to the Garden, spoke before the engineering colleges of Cornell University, April 25, on "Timber as an Engineering Material."

Mr. G. H. Pring, Horticulturist to the Garden, gave a talk before the St. Louis Florist Club, May 15, on "The Orchid Exhibition at Boston."

The annual Flower Sermon provided for in Mr. Shaw's will was preached on May 18 at Christ Church Cathedral by the Rev. Theodore Sedgwick, D. D., Rector of Calvary Church, New York City.

Dr. George T. Moore, Director of the Garden, acted as delegate for the Garden Club of St. Louis at the annual meeting of the Garden Club of America, held under the auspices of the James River Garden Club at Richmond, Virginia, April 23-25.

Mr. G. H. Pring has given the illustrated talk "Collecting Orchids in South America" before the following audiences: April 21, before the Carpe Diem Club; April 28, before the Nelson Presbyterian Church, Pine Lawn, St. Louis County; May 5, Fremont School geographical science class; May 10, at a banquet of the graduate of the Old Kewites, Brunswick Hotel, Boston, Mass.; May 16, Froebel School Patrons' Association.

The American Dahlia Society has established at the Garden a trial ground for new varieties of dahlias to be known as the "Middle West Dahlia Trial Garden." Dahlias can be entered by the raiser or introducer only and must be new varieties not less than two years old. Certificates of merit will be awarded for varieties scoring eighty-five points or higher if they have been registered with the secretary of the American Dahlia Society. Entry blanks and additional information may be obtained by writing to the Garden.

Dr. Moore and Mr. Pring attended the first annual show of the American Orchid Society in Boston, May 8-11. Dr. Moore, with Mr. Gurney Wilson, Editor of the Orchid Review of London and Secretary of the Orchid Committee of the Royal Horticultural Society of England, and Mr. Clement Moore, of Hackensack, New Jersey, constituted the judges for the show. The following acted as advisory judges in special classes: Professor Charles S. Sargent, Director of the Arnold Arboretum; Professor Oakes Ames, Director of the Harvard Botanic Museum; Mr. Thomas Allen, Chairman of the Boston Art Commission; Miss Marian R. Case, Hillcrest Gardens, Weston, Massachusetts; and Mr. H. Walter Childs, specialist in hardy New England orchids.

STATISTICAL INFORMATION FOR APRIL, 1924

GARDEN ATTENDANCE:

Total number of visitors	30,418

PLANT ACCESSIONS:

Total number of seed packets received in exchange	331
Total number of plants received in exchange	14

PLANT DISTRIBUTION:

Total number of plants distributed as gifts	7

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	7
Total number of books and pamphlets donated	255

HERBARIUM ACCESSIONS:

By Gift—	
Conard, Professor H. S.—*Merulius tremellosus* from Iowa	1
Hennicke, Miss D.—*Lamium amplexicaule* L. and *Viola Rafinesquii* Greene from Missouri	2
Palmer, E. J.—Photographs of *Celtis laevigata* and *Quercus Durandii*	3
Payson, Dr. E. B.—*Senecio sp.*, from Wyoming	1
Stevens, Prof. F. L.—*Polyporus fruticum*, from Costa Rica	1
By Purchase—	
Gleason, Dr. H. A.—Plants of British Guiana, 7th set, Distribution VI	462
By Exchange—	
Drushel, Prof. J. A.—Plants of Vermont, New York, Michigan, Missouri and Texas	17
Iowa Agricultural College, by Professor L. H. Pammel— Grasses of Switzerland	207
Total	694

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director

BENJAMIN M. DUGGAR
Physiologist in charge of Graduate Laboratory

HERMANN VON SCHRENK
Pathologist

JESSE M. GREENMAN
Curator of Herbarium

EDWARD A. BURT
Mycologist and Librarian

EDGAR ANDERSON
Geneticist

JOANNE K. ARMSTRONG
Research Assistant

KATHERINE H. LEIGH
Secretary to the Director

NELL C. HORNER
Editor of Publications

G. H. PRING
Horticulturist

JOHN NOYES
Landscape Designer

PAUL A. KOHL
Floriculturist

EDGAR ANDERSON
In charge of School for Gardening

P. C. BRAWNER
Painter

J. CUTAK
Exotics

W. C. FAIRBANK
Plant Recorder

A. HUBER
Aquatics

J. H. KELLOGG
Herbaceous and Nursery

W. F. LANGAN
Engineer

J. LANGAN
Assistant Engineer

C. MCGOVERN
Outside Floral Display

D. MILLER
Orchids

G. NINTEMAN
Construction and Farms

J. ULRICH
Inside Floral Display

H. VALLENTINE
Carpenter

Missouri Botanical Garden Bulletin

Vol. XII JUNE, 1924 No. 6

CONTENTS

	Page
What to Plant in City Gardens	69
A Spring Visit to Some St. Louis Gardens	79
Notes	84
Statistical Information	85

ST. LOUIS, MO.
1924

Published Monthly Except July and August by the Board of Trustees

SUBSCRIPTION PRICE:

ONE DOLLAR PER YEAR SINGLE COPIES TEN CENTS

BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

President

EDWARDS WHITAKER.

Vice-President

DAVID S. H. SMITH.

SAMUEL C. DAVIS.

EDWARD C. ELIOT.

GEORGE C. HITCHCOCK.

THOMAS S. MAFFITT.

EDWARD MALLINCKRODT.

A. C. F. MEYER.

PHILIP C. SCANLAN.

JOHN F. SHEPLEY.

EX-OFFICIO MEMBERS

HERBERT S. HADLEY,
Chancellor of Washington University

HENRY W. KIEL,
Mayor of the City of St. Louis

FREDERICK F. JOHNSON,
Bishop of the Diocese of Missouri

GEORGE T. MOORE,
President of The Academy of Science of St. Louis

HENRY A. ROSSKOPF,
President of the Board of Education of St. Louis

CHARLES A. ROE, Secretary.

MAP OF ST. LOUIS, SHOWING ZONES WITH REFERENCE TO VEGETATION.
(Prepared by City Park Department.)

Missouri Botanical Garden Bulletin

Vol. XII JUNE, 1924 No. 6

WHAT TO PLANT IN CITY GARDENS

A problem which confronts both amateur and professional gardeners is how, when, and what to plant for permanent effect in our city gardens where conditions are often so unfavorable for plant growth. The Garden Club of St. Louis at its recent show at the Garden distributed a list of various shrubs, perennials, vines, and annuals, recommended for planting in city gardens which cannot but be helpful. It is more than likely, however, that amateurs in certain areas of St. Louis would have many disappointments if they attempted to carry out all the suggestions unless they went to the annual expense of replacing such plants as larkspur, columbine, gaillardia, lychnis, oriental poppy, pyrethrum, etc. Experience has shown that in gardens located in proximity to the railroad terminals and rights-of-way, brick yards, and congested downtown districts it is an almost hopeless task to establish such plants.

The City Park Department has made repeated attempts to establish trees and perennials around the Municipal Courts building, the Public Library, and at the Lucas garden, with little or no success. Sycamores and poplars, supposedly smoke-resistant, succumb within two or three years; in fact, the only tree which seems to thrive in such localities is the Tree-of-Heaven (Ailanthus). Of the large number of shrubs which have been repeatedly planted, only Ligustrum, Rhus, Lycium, and *Aralia pentaphylla* remain, Lycium standing out as the most resistant to smoke. Permanent blue-grass lawns in the downtown district are out of the question. A green lawn in early spring is the result of annual seeding

with red top, but this is soon crowded out by the annual grasses which permanently reseed themselves. The Lucas garden is planted during the summer with tropical bedding plants and these furnish a highly colored floral display until the advent of frost. Throughout the winter the garden is devoid of any permanent vegetation. Farther west toward Grand Avenue there is a little improvement, but the small parks at the Lindell Avenue and Washington Avenue cut-offs are green only because of the annual grasses. The Central States Life Insurance Co., at 3200 Washington Avenue, attempted to establish a formal garden west of the office building. This was planted with various shrubs and perennials, also Lombardy poplars to exclude the surrounding buildings. All the perennials, after making scanty growth, died the first year, and annual replacement is necessary. The most permanent shrubs are the Regel's and California privet (most of the latter dying out last winter) and *Cornus stolonifera*. There are two lilacs which have maintained themselves for the last three years but without producing flowers. *Berberis Thunbergii* has been replanted several times, usually succumbing to the first winter. The Lombardy poplars call for replacement annually. Last fall peonies were planted, but despite the favorable season their growth soon became soot-coated and the flower buds failed to open. It is only by the use of summer bedding and annuals that any sort of garden effect can be maintained.

Such open spaces as Tower Grove Park, Compton Heights Reservoir Park, and the Missouri Botanical Garden show some improvement over downtown conditions. However, the number of species lost annually from the Garden collection, particularly during the past ten years, has been so discouraging that steps are being taken to create an out-of-town garden, so that the reputation of the Missouri Botanical Garden as one of the foremost botanical gardens of the world may be maintained. Thirty years ago the Garden was noted for its complete collections of conifers and evergreens. To-day there are left a few dying Austrian pines, a small procumbent Canadian hemlock opposite the old residence, and one yew, opposite the Cleveland Avenue gate-house, surrounded by the lilac collection, which also shows the effect of the

smoke. The holly, as previously noted in the December, 1920, number of the BULLETIN, is still withstanding the unfavorable conditions. Many good specimens may be seen in the grove, although the soot-covered leaves in most cases are deciduous in advance of the normal period.

Most of the original deciduous trees planted by Henry Shaw have succumbed, especially the white birch, hard maple, Norway maple, and the oaks, the latter usually dying at the top first. The rapidity with which the oaks are dying in Forest Park suggests the spreading of the smoke area. Newly planted oaks seem to flourish up to the point when the bark begins to assume its permanent corky character; then there is a decided stunting of growth. This factor is particularly noticeable in the many specimens planted out in the North American tract some twenty years ago. In 1920 a test plot was set aside for establishing a nut orchard adjacent to the old barn, and new varieties of the English, Persian, and native walnuts were planted, as well as special varieties of pecans. The native walnuts seem to be developing slowly but the pecans have mostly died out. The most resistant of the trees are the sycamores, ginkgo, bald cypress, osage orange, soft maple, varnish tree, Scotch elm, catalpa, Ailanthus, ash, American linden, and buckeye.

Comparing city-grown shrubs with those out of town, the most noticeable difference is the lack of flowers and fruit. The amount of dead wood annually removed is also much greater from shrubs growing in the city. During the spring visitors inquire for the flowering dogwood (*Cornus florida*) and when shown specimens look at them with disgust, remarking upon the wonderful plants in flower in the country. The best specimen of dogwood in the Garden was planted in the North American tract over twenty years ago. It is now about twelve feet high, having a trunk three inches in diameter, yet under the most favorable conditions it has never produced more than twenty-five flowers and frequently none at all appears. An older specimen, undoubtedly planted during Mr. Shaw's lifetime, is located immediately south of the floral display house. Formerly it had several basal branches but these have died away, leaving one main leader. This occasionally produces a few flower buds in the fall but

these never develop in the spring; in fact, it has not expanded flowers for the past ten years. Several attempts to establish special varieties of Cornus, collected from the surrounding country, have also failed.

PERENNIALS

In recent years elaborate attempts have been made to establish the showy hybrid larkspurs, columbines, etc. Various experiments have been carried out in the specially prepared beds of the test garden west of the administration building. Several years ago a special collection of the finest hybrids from England was planted, but none of them survived, although this was partly due to the poor condition in which many of them arrived. Further tests were continued, this time with selected English seeds. These were sown in early fall in a cool greenhouse and after germination were grown on in the same house. By this method plants in four-inch pots were established by spring and these were planted out in the test garden just as soon as possible. The plants showed fairly satisfactory growth and flower spikes but at least 75 per cent of the clumps were gradually lost due to unfavorable conditions. To maintain a permanent display of perennials the Garden, and likewise the Park Department, has learned by experience that plants left outside throughout the winter cannot be relied upon, but the more tender kinds, such as larkspur (Delphinium), columbine (Aquilegia), Platycodon, hollyhock (Althea), Pyrethrum, Gaillardia, Coreopsis, Plumbago, and the biennials, such as fox-glove (Digitalis) and sweet-william (Dianthus), must be treated as annuals. A test of columbines was carried on in 1923 in the wild-flower garden with both the native long-spurred hybrids and *Aquilegia californica*. The latter produced a splendid bed, growing to a height of four to five feet and flowering profusely. The outlook for establishing this variety in the Garden seemed very promising, but the next spring the entire bed had died out.

Not only perennials but all plants, including trees, are killed back to a much greater extent in the city, the damage gradually diminishing the farther one travels into the

country. This winter fifty per cent of the native wild plants at the Garden were killed, although identical species showed no effect of the winter in their native haunts. The Chinese paper mulberry and Paulownia trees, some of them a foot in diameter, were killed back to the ground. Neither of these trees was seriously damaged in the county. The common mulberry froze back several feet in the Garden but not beyond the smoke area. The flowering buds of both the staminate and pistillate ginkgo trees were frozen only in the city.

During the past winter the following shrubs at the Garden froze back to the ground: *Hibiscus syriacus, Vitex, Deutzia scabra, Ligustrum, Kerria,* and *Buddleia.* Those seriously damaged included *Forsythia, Diervilla, Amorpha, Tamarix,* and *Rhus.* In the country the California privet, *Kerria, Buddleia,* and *Vitex* were the only plants showing the effect of the hard freeze. The following perennials have been proved hardy under city conditions and do not normally freeze out in winter: golden-rod, marguerite, day-lily, native penstemon, physostegia, tradescantia, sedum, veronica, iris, peony, pansy, achillea, gas-plant, *Spiraea Filipendula, Poterium obtusum,* candytuft, thalictrum, native asters, lily-of-the-valley, shooting star, sun-flower, chrysanthemum.

The greatest damage at the Garden was with the roses, almost 75 per cent of the plants in the nursery and permanent rose garden being lost. The hybrid teas suffered most severely, but the hybrid perpetuals in most cases froze to the ground, and the entire collection of climbing roses upon the pergola and fronting the Linnean House likewise were frozen back. Observation of many gardens in the county showed that the roses were not frozen more seriously than during an average normal winter, the climbing roses especially showing the contrast between county and city conditions. In certain outlying sections of the city where the effect of the smoke is not serious the roses were not touched. Both observation and experience seem to indicate that plants grown under unfavorable city conditions are weakened to an extent that renders them unable to withstand the same amount of frost as vegetation in the country. This situation is not confined to outdoor plants but greenhouse plants are

similarly affected as well. The commercial florists have, where possible, removed their producing greenhouses into the country to avoid the damaging effects of a smoky atmosphere.

CITY PLANTING ZONES

The City Park Department has been forced to discontinue its nursery, formerly within the city park area, moving to a large tract of land facing the river at Chain-of-Rocks. Here a splendid nursery has been established for several years, producing sufficient plants to supply not only new parks and boulevards but to replace the thousands of plants which die annually in the smoke-laden areas.

Within this last few years, the Park Department, collaborating with the Garden, has tested numerous trees, shrubs, and perennials in various parts of the city for their smoke resistance. As a result the entire city has been divided into zones and a list made of the various trees and shrubs that have survived in these areas. While it is almost impossible definitely to outline districts, since they usually merge gradually from one to the other, the information obtained furnishes a workable basis for general purposes. The worst region is No. 3 (see plate 15), and this is to be expected since it includes the Mill Creek Valley as well as the crowded business district from which volumes of smoke arise, particularly during the winter. Zone No. 2 is somewhat scattered, being in most cases away from the railroads and manufacturing plants, embracing the more or less open tracts set aside as parks, including the Garden. The most favorable areas for vegetation are: on the north, Bellefontaine and Calvary cemeteries; on the northwest, Kingshighway and Union Avenue district; on the southwest, the Clifton Heights district; and on the south, Southampton towards the Gravois Road.

The following lists of plants form a comprehensive basis by which amateurs, gardeners, and landscape architects may be guided in planning city gardens, especially when considering permanent effects. The cross mark signifies that the particular plant is recommended for the district indicated

by number on the map (see plate 15). Annuals have not been considered, inasmuch as their growth is developed throughout the summer and they can be grown in any part of the city where soil and situation are favorable.

LIST OF TREES AND SHRUBS, WITH THE DISTRICT FOR WHICH RECOMMENDED

BOTANICAL NAME	COMMON NAME	DISTRICT 1	2	3
	DECIDUOUS TREES			
Acer Negundo	Box-Elder	X	X	
Acer platanoides	Norway Maple	X		
Acer Pseudo-platanus	Sycamore Maple	X		
Acer saccharinum	Silver-leaved Maple	X	X	
Acer saccharinum var. *Wieri*	Wier's Cut-leaved Maple	X	X	
Acer saccharum	Sugar Maple	X		
Aesculus Hippocastanum	Horse-Chestnut	X	X	
Ailanthus altissima	Tree-of-Heaven	X	X	X
Betula alba	White Birch	X		
Broussonetia papyrifera	Paper Mulberry	X	X	X
Catalpa Bungei	Chinese Catalpa	X	X	
Catalpa speciosa	Western Catalpa	X	X	
Celtis occidentalis	Hackberry Tree	X		
Cercis canadensis	Red Bud Tree	X	X	
Chionanthus virginica	White Fringe	X	X	
Cornus florida	White Flowering Dog-wood	X		
Fraxinus americana	American White Ash.	X	X	
Fraxinus lanceolata	Green Ash	X	X	
Gleditsia triacanthos	Honey Locust	X	X	
Ginkgo biloba	Maiden-hair Tree	X	X	
Koelreuteria paniculata	Varnish Tree	X	X	
Liquidambar Styraciflua	Sweet Gum	X	X	
Liriodendron tulipifera	Tulip Tree	X	X	
Maclura pomifera	Osage Orange Tree	X	X	X
Magnolia acuminata	Cucumber Tree	X	X	
Magnolia virginiana	Sweet Bay Magnolia	X		
Magnolia tripetala	Umbrella Tree	X	X	
Magnolia Soulangeana	Chinese Magnolia	X	X	
Malus ioensis	Wild Flowering Crab.	X		
Morus alba	White Mulberry	X	X	
Morus alba var. *pendula*	Tea's Weeping Mulberry	X	X	
Platanus occidentalis	American Plane	X	X	X
Platanus orientalis	European Plane	X	X	X

BOTANICAL NAME	COMMON NAME	DISTRICT 1	2	3
Populus alba var. *pyramidalis*	Bolle's Silver Poplar	X		
Populus deltoides var. *monilifera*	Carolina Poplar	X	X	
Populus nigra var. *graeca*	Grecian Poplar	X	X	
Populus nigra var. *italica*	Lombardy Poplar	X	X	
Populus tremuloides	American Aspen	X		
Prunus serotina	Wild Black Cherry	X		
Quercus alba	White Oak	X		
Quercus macrocarpa	Mossy Cup or Bur Oak	X		
Quercus palustris	Pin Oak	X		
Quercus rubra	Red Oak	X		
Robinia Pseudo-Acacia	Black Locust	X	X	X
Salix babylonica	Weeping Willow	X	X	
Salix blanda	Wisconsin Weeping Willow	X	X	
Salix elegantissima	Thurlow Weeping Willow	X	X	
Tilia americana	American Linden	X	X	
Tilia vulgaris	European Linden	X		
Tilia tomentosa	White or Silver Linden	X		
Ulmus americana	American Elm	X	X	
Ulmus campestris	English Elm	X	X	

EVERGREEN OR CONIFEROUS TREES*

Abies concolor	White Fir	X		
Juniperus communis var. *hibernica*	Irish Juniper	X		
Juniperus Counarti		X		
Juniperus virginiana	Red Cedar	X		
Picea pungens	Colorado Spruce	X		
Picea pungens var. *glauca*	Colorado Blue Spruce	X		
Pinus nigra var. *austriaca*	Austrian Pine	X		
Pinus Montana var. *Mughus*	Dwarf Mountain Pine	X		
Pinus sylvestris	Scotch Pine	X		
Thuja occidentalis	American Arbor-vitae	X		
Thuja occidentalis var. *Wareana*	Siberian Arbor-vitae	X		
Thuja occidentalis var. *pyramidalis*	Pyramidal Arbor-vitae	X		
Thuja orientalis	Oriental Arbor-vitae	X		
Tsuga canadensis	Hemlock	X		

*Evergreens are only temporary within the city limits, but their beauty and attractiveness will repay for the necessary replacing with new stock whenever required. The above kinds may be recommended.

DECIDUOUS ORNAMENTAL SHRUBS

BOTANICAL NAME	COMMON NAME	DISTRICT 1	2	3
Amorpha fruticosa	False Indigo	X	X	
Aralia spinosa	Hercules Club	X	X	X
Aralia chinensis	Chinese Angelica Tree	X	X	
Aralia pentaphylla	Shrub Aralia	X	X	X
Baccharis halimifolia	Groundsel Bush	X	X	
Berberis Thunbergii	Japanese Barberry	X	X	
Calycanthus floridus	Strawberry Shrub	X	X	
Cephalanthus occidentalis	Button-Bush	X	X	
Colutea arborescens	Bladder Senna	X	X	X
Cornus alba	Siberian Dogwood	X	X	
Cornus Amomum	Silky Dogwood	X	X	
Cornus racemosa	Gray Dogwood	X	X	
Cornus sanguinea	Red Dogwood	X	X	X
Cornus stolonifera	Red Osier Dogwood	X	X	X
Cydonia japonica	Japanese Quince	X	X	
Deutzia scabra	Deutzia	X	X	
Deutzia gracilis	Dwarf Deutzia	X	X	
Diervilla	Weigelia	X	X	
Elaeagnus angustifolia	Oleaster	X	X	
Elaeagnus longipes	Japanese Oleaster	X	X	
Forsythia viridissima	Green Forsythia	X	X	
Forsythia intermedia	Hybrid Golden-Bell	X	X	
Forsythia suspensa	Drooping Golden-Bell	X	X	
Halesia carolina	Silver-Bell	X		
Hibiscus syriacus	Rose-of-Sharon	X	X	
Hydrangea paniculata	Hydrangea	X	X	
Kerria japonica	Globe-flower	X	X	
Lespedeza bicolor	Bush Clover	X		
Ligustrum amurense	Amoor River Privet	X	X	
Ligustrum Ibota	Japanese Privet	X	X	
Ligustrum Ibota var. *Regelianum*	Regel's Privet	X	X	X
Ligustrum ovalifolium	California Privet	X	X	X
Ligustrum sinense var. *nana*	Chinese Privet	X	X	
Ligustrum vulgare	English Privet	X	X	
Lonicera bella	Zabel's Honeysuckle	X	X	
Lonicera fragrantissima	Fragrant Honeysuckle	X	X	
Lonicera Morrowi	Japanese Bush-Honeysuckle	X	X	
Lonicera tatarica	Tartarian Honeysuckle	X	X	
Lycium vulgare	Matrimony Vine	X	X	X
Philadelphus coronarius	Mock-Orange	X	X	
Philadelphus coronarius var. *Lewisi*	Gordon's Orange	X	X	
Philadelphus coronarius var. *grandiflorus*	Large Flowering Orange	X	X	

BOTANICAL NAME	COMMON NAME	DISTRICT 1	2	3
Philadelphus coronarius **var.** ***inodorus***	Scentless Orange	X	X	
Philadelphus Lemoinei	Hybrid Orange	X	X	
Physocarpus opulifolius	Ninebark	X	X	
Rhodotypos kerrioides	White Kerria	X	X	
Rhus copallina	Dwarf Sumach	X	X	
Rhus Cotinus	Smoke Tree	X	X	
Rhus glabra	Smooth Sumach	X	X	X
Rhus typhina	Staghorn Sumach	X	X	
Rhus typhina **var.** *laciniata*	Staghorn Sumach	X	X	
Ribes aureum	Missouri Currant	X	X	
Ribes Gordonianum	Gordon's Currant	X	X	
Ribes sanguineum	Red Flowering Currant	X	X	
Robinia hispida	Rose Acacia	X	X	
Rosa rugosa	Japanese Rose	X	X	
Rosa (hybrid perpetual)		X	X	
Rosa (hybrid tea)		X	X	
Rosa (hybrid Polyantha)		X	X	
Rosa (Rambler)		X	X	
Rosa Wichuriana		X	X	
Sambucus canadensis	American Elder	X	X	X
Sambucus nigra	European Elder	X	X	
Sambucus pubens **var.** *laciniata*	Cut-leaved Elder	X	X	X
Spiraea arguta	Snow Garland	X	X	
Spiraea Billiardii	Billiard's Spiraea	X	X	
Spiraea Bumalda	Pink Spiraea	X	X	
Spiraea Bumalda "Anthony Waterer"	Crimson Spiraea	X	X	
Spiraea callosa **var.** *alba*	White Spiraea	X	X	
Spiraea Douglasii	Douglas Spiraea	X	X	
Spiraea prunifolia	Bridal Wreath	X	X	
Spiraea Reevesiana	Meadow-sweet	X	X	
Spiraea Van Houttei	Meadow-sweet	X	X	
Symphoricarpos racemosus	Snow-berry	X	X	
Symphoricarpos vulgaris	Coral-berry	X	X	
Syringa persica	Persian Lilac	X	X	
Syringa persica **var.** *alba*	Persian White Lilac	X	X	
Syringa vulgaris	Common Lilac	X	X	
Syringa vulgaris **var.** *alba*	Common White Lilac	X	X	
Tamarix africana	African Tamarisk	X	X	
Tamarix juniperina **var.** *plumosa*	Japanese Tamarisk	X	X	
Tamarix odessana	Caspian Tamarisk	X	X	
Tamarix hispida **var.** *aestivalis*	Hybrid Tamarisk	X	X	
Viburnum Lantana	Wayfaring Tree	X	X	
Viburnum Opulus	High Bush Cranberry	X	X	
Viburnum Opulus **var.** *sterile*	Common Snowball	X	X	

BOTANICAL NAME	COMMON NAME	DISTRICT 1	2	3
Viburnum tomentosum	Single Japanese Snowball	X	X	
Viburnum tomentosum plicatum	Double Japanese Snowball	X	X	
Vitex Agnus-Castus	Chaste Tree	X	X	

A SPRING VISIT TO SOME ST. LOUIS GARDENS

In order that the actual results obtained by amateurs in establishing successful backyard gardens might be recorded, three young women of the School for Gardening, Miss Katherine Perkins, Miss Edith Mason, and Miss Ruth Dowell, visited a few of these gardens early this spring and their observations follow: It should be borne in mind that the success of these gardens is due not only to the selection of plants adapted to a particular environment, but also to an intelligent care, which means an expenditure of time and labor such as only an enthusiast is willing to devote to a garden.

BACKYARD GARDENS

"The following account of diverse gardens in various sections of St. Louis, including two gardens in the downtown district, indicates what has already been done and suggests possibilities for further beautification of the city. These gardens were selected at random and photographed at a time when they probably did not represent the height of beauty which they were capable of attaining.

"The first three gardens are on the south side. An Arsenal Street garden proves that smoke need not discourage quantity of bloom. The yard, 84x35 feet, seen from the house looks like one great flower bed, for the dividing paths of cinders edged with wood are only a foot and a half wide. Rose trellises are spaced down the center bed, a bird house topping one of them. A home-made bird bath (a shallow pottery dish resting on a four-foot creosoted pole) is close by. The service path is on the extreme right and the laundry poles on a two-

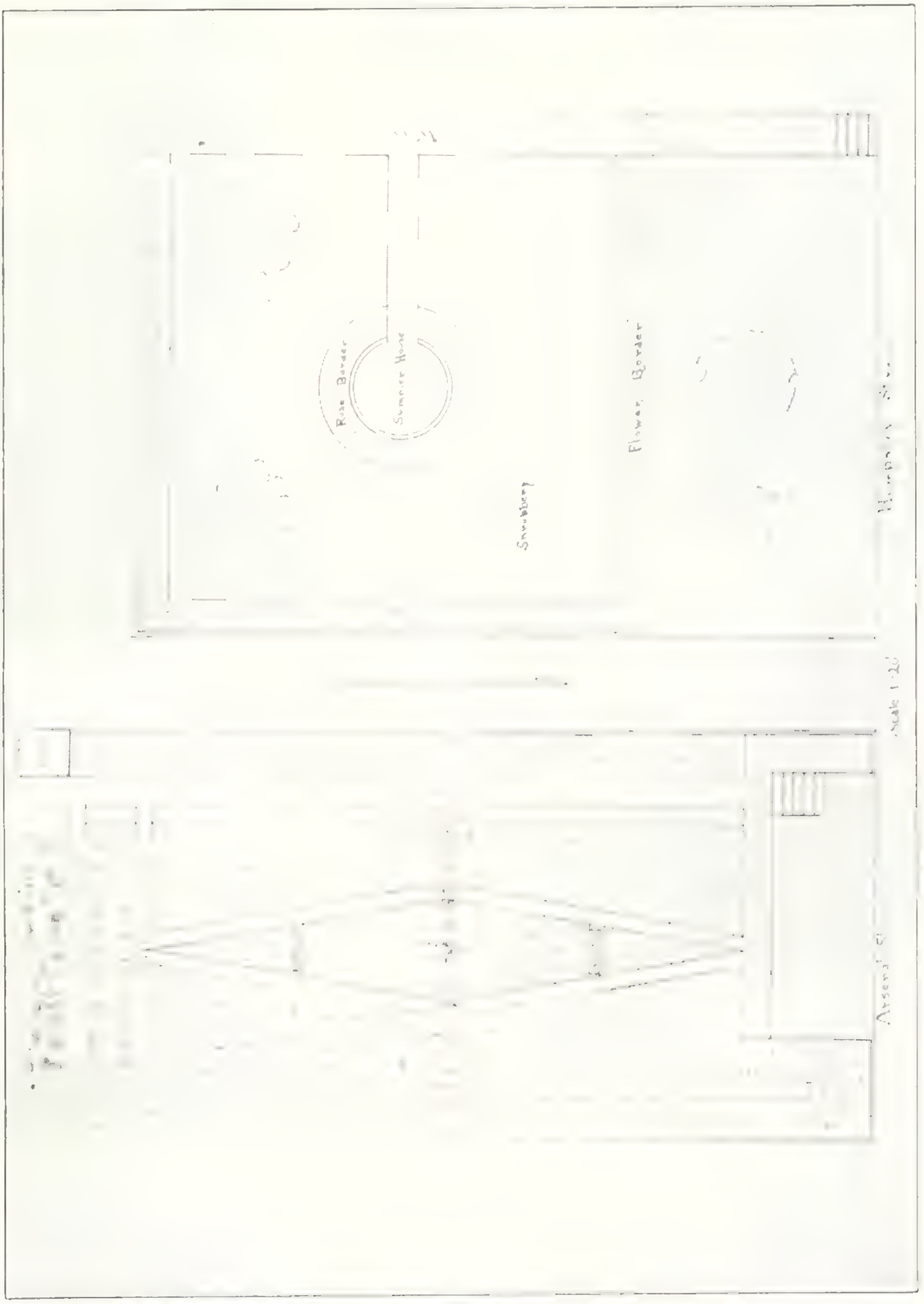
foot border of turf line it, so that no precious space may be wasted.

"The peony bush is rightfully the *piéce de resistance* of most small gardens, for its foliage remains a bright cool green throughout the summer. Spring is also represented in this garden by narcissus, tulips and iris, with columbine, oriental poppies and larkspur. Many wild flowers, such as trillium, Solomon's seal, have oriented themselves in a sheltered corner. A forest of labels indicates the owner's interest in many different varieties of one plant.

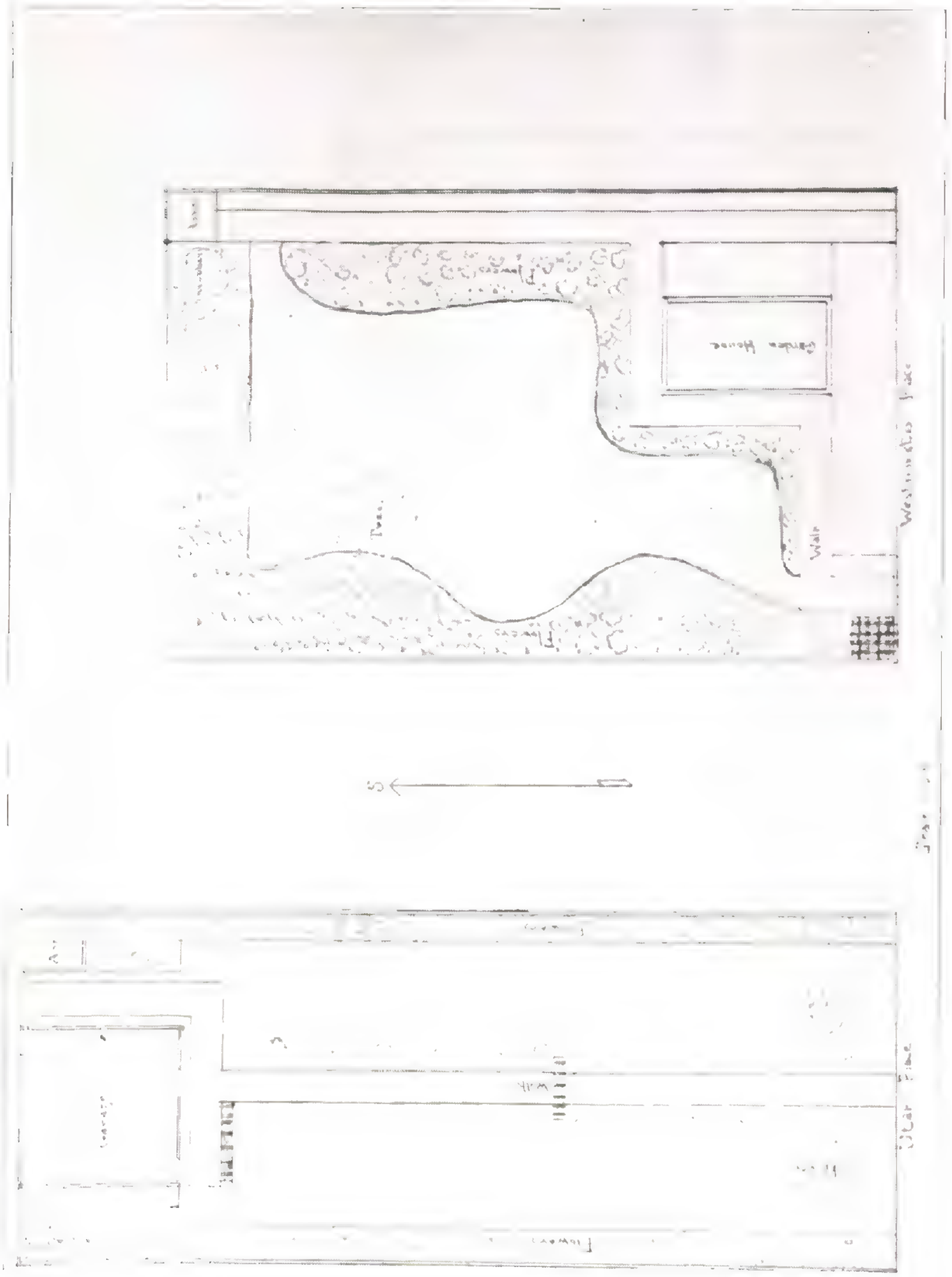
"A little round summer house or gazebo is the principal attraction on a corner lot 65 x 51 feet. It is set 22 feet back from Humphrey Street and protected by a line of trees. The enclosing wire fence is covered with rose vines rooted in a two-foot border of pansies, and in the corners are grouped fruit trees, snowballs, etc. In the center, surrounded by a three-foot rose border, is the latticed summer house, of nine-foot diameter, offering absolute privacy from the passer-by who is only thirty feet away.

"Another south-side garden on Utah Place shows how an ordinary backyard, approximately 80 x 30 feet, can be transformed into a very delightful spot. The owner is not satisfied merely with growing plants but believes also in quality of production. Here he grew dahlias which ran away with a lot of the first and second prizes given at the Missouri Botanical Garden First Annual Dahlia Show last fall. The space in the borders and beds which grew the prize-winning dahlias is devoted to a very creditable display of tulips during the spring. These tulips include, among others, large specimens of Pink Beauty, Kaiser Kroon, and Pride of Haarlem. Pink rambler roses overspread the trellis work, while peonies, hyacinths, pansies, and daffodils fill the various small beds. Even all this leaves room for two broad greenswards, that fill the central area at either side of the walk. The owner of this garden has originated a very clever little propagating frame. It is three feet long, one foot broad, and nine inches high, made of boards and covered in front and on top with shaded glass. It slopes slightly towards the front in order that the seedlings may receive the sun's rays more vertically.

"The Central States Life Insurance Company's building



PLANS OF ARSENAL STREET AND HUMPHREY STREET GARDENS



PLANS OF UTAH PLACE AND WESTMINSTER PLACE GARDENS.

on Washington Avenue is indeed an innovation in office-building construction. It is built in the Spanish mission style, of cream-colored stucco with red tile roofs. To the west of the building is a large space, 160 x 60 feet, laid out as a garden. The cool spacious lawn is margined by a five-foot border of shrubs and an occasional poplar tree, and the whole garden is enclosed by a high stucco wall crowned with red tile. The great amount of soot and dirt in this section of town has proved discouraging to most shrubs and perennials, but the Company is persistent in attempting to replace these with hardier and more tolerant plants.

"On Washington Boulevard, four blocks below Grand, is a flourishing Japanese garden built a good many years ago entirely by the owner and his Japanese servant. Two and a half carloads of stone were brought from Iron Mountain to build the walls, ponds, bridges, lanterns, and the miniature Fuji mountain that most effectively conceals the ashpit. The bald statistics of 250 feet of paths and nine fountains or water-falls in a lot 60 x 40 feet sounds quite staggering, but the parts of the design blend into the whole in such a way that they do not offend the eye. From the top of the "mountain" one gazes down on an orderly sequence of water-falls (one rippling over a shutter set in the stone), ponds, bridges, and fountains. On a catalpa tree, trained in wierd shape, climb two snakes, the top one spouting water three or four feet in the air, the water dropping into a shell bird-bath on the ground below. There is also a crocodile that spouts water on a frog and, much to the delight of the owner (who himself made these animals out of lead), small boys are continually throwing sticks over the fence to see if the frog will move.

"Wistaria grows over the walls, torii (temple gates), and an umbrella-shaped frame; papyrus shades the gold-fish from the glare of the summer sun, while a big sweet-gum tree protects the "mountain climber." Moreover, time and smoke have not discouraged such wild flowers as the false Solomon's seal which is still blooming after seventeen years. Twenty-year-old May-apple plants, though not blooming, are fairly healthy. Lilies-of-the-valley, pansies, and iris (the latter, however, not blooming in the shade) are successfully

withstanding the smoke. Special mention should also be made of a tree, the golden varnish tree, which here, as elsewhere, has proved itself particularly hardy under adverse conditions. The joy of having a garden of one's own is shown by the fact that although the owner has traveled extensively in this and other countries, he prefers his garden to any he has ever seen.

"The owner of a back-yard garden in the 6100 block of Westminster Place attributes her success in her fight against adverse city conditions to heavily fertilized soil. She dug down three feet, laid on three feet of fertilizer, and replaced six inches of top soil. Every fall she covers her beds with leaves which are spaded into the soil the following spring. She considers her yard of 69 x 44 feet too small to devote any space to bushes except to hide the ash pit, so it is bordered by irregularly shaped beds about six feet wide. Built on to the back of the house and extending into the garden is a little vine-covered garden house, 9 x 16 feet, in which are her collection of fish and a few plants. A table and some chairs, shaded by a great striped umbrella, make a very cozy spot from which to enjoy the garden at one's ease. As the owner will allow only the healthiest plants to stay and has limited herself to a few kinds, the effect is very rich. Tulips, iris, peonies, larkspur, and columbine predominate.

"In the western part of town a stately old house towers over spacious grounds and is in turn lorded over by a magnificent aged elm which doubtless has served as a landmark for many decades. In the rear of the property a steep bank slopes down into the gorge where the car-line has cut its way. This bank is terraced with narrow paths, between which wild flowers, lilies-of-the-valley, azaleas, vines, huge magnolias, catalpas, and other trees and shrubs form a veritable woodland. The delightful disregard with which the lilies-of-the-valley have spread over into the pathways and the phlox and Virginia creeper have ventured out from their original confines and with which the shrubs have grown into surprising confusion increases the charm of the garden's aging beauty. Crowning this bank is a rock garden with meandering stream, shaded by magnolias and crossed by tiny

AN ARSENAL STREET GARDEN.

JAPANESE GARDEN ON WASHINGTON BOULEVARD.

BACK-YARD GARDEN ON UTAH PLACE.

BACK-YARD GARDEN ON WESTMINSTER PLACE.

bridges. Vine-covered benches offer one an opportunity to enjoy this feature which is all too rare in city gardens.

"The foregoing gardens indicate that there is no reason, except lack of inclination, for failing to beautify the back-yard and, incidentally, the community, if one keeps to simple design and to plants that have been proved to be defiers of smoke."

BEAUTIFYING A RAILROAD STATION

"Gardening in the city is, at best, a difficult undertaking, and one often becomes so discouraged after a few experiences that no further attempts are made to find the plant or plants that will flourish under these conditions.

"It would be difficult to find any location, because of almost continuous smoke and poor soil, more undesirable for plant growing than the banks along a railroad track and yet plants are growing and blooming on some railroad banks in St. Louis. Three years ago the Missouri Pacific Railway made an attempt to beautify its Tower Grove station by planting several of the commoner sorts of tall bearded iris, principally *Iris Kochii* and an undetermined variety known to the local trade as 'Bluebird.' The plants are set in a long bed between the platform and the retaining wall, and while there is a narrow crack of sky directly overhead most of the sunlight is shut off by the train shed to the south. In this most difficult of situations they have not only bloomed but the roots have actually increased somewhat in size during the three years. Across the tracks from the station and at several points in the railroad yards iris beds were planted in full sunlight and in spite of smoke and cinders they have made fairly satisfactory clumps. It is an unusual but an encouraging sight to see these beds in the springtime, a mass of purple and lavender bloom against the bare waste of the railroad yards.

"A vine which is doing well in the same location is the matrimony vine (Lycium). With its fine leaves and brilliant fruit it is decidedly ornamental and its thrifty growth at the Tower Grove Station shows that it can conquer adverse situations. As the head gardener for the railroad station

said: 'After it once gets a start you couldn't kill it out if you wanted to'."

NOTES

Mr. G. H. Pring, Horticulturist to the Garden, gave an illustrated talk on "Collecting Orchids in South America" before the St. Louis Electrical Board of Trade, at the Hotel Statler, May 27.

Dr. George T. Moore, Director of the Garden, lectured before the Garden Club of Lake Geneva, Wisconsin, June 25, on "What Goes On in the Soil."

At the commencement of Washington University, June 12, degrees were conferred upon members of the graduate laboratory at the Garden, as follows: Doctor of Philosophy and Master of Science (as of 1923), Carl Clawson Epling; Master of Science, Fanny Fern Smith and Louise M. Stupp.

Recent visitors to the Garden include Dr. H. M. Jennison, professor of botany, University of Tennessee, and Dr. R. W. Webb, of the Office of Cereal Investigations, U. S. Department of Agriculture, at Madison, Wisconsin.

TOWER GROVE STATION GARDEN.

IRIS BEDS ACROSS THE TRACKS FROM TOWER GROVE STATION.

STATISTICAL INFORMATION FOR MAY, 1924

GARDEN ATTENDANCE:

Total number of visitors.....36,283

PLANT ACCESSIONS:

Total number of seed packets received as gifts..... 78
Total number of plants received as gifts..... 234

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought..... 46
Total number of books and pamphlets donated..... 167

HERBARIUM ACCESSIONS:

By Gift—

Allen, F. H.—Cultivated specimens of *Zantedeschia Rehmannii* (Schott) Engler..... 1

Buchholz, Prof. John T.—*Phlox bifida* Beck from Arkansas 1

Cooper, Charles H.—*Amsonia Tabernaemontana* Walt. from Louisiana..... 1

Fawcett, Prof. H. S.—*Poria* sp. on date palm from Arizona 1

Gleason, Dr. H. A.—Fruit of *Ephedra* from British Guiana 1

Latham, Roy—Fungi from New York..... 2

Lehman, Louis J.—*Rumex acetosella* Linn. from Missouri 1

Moeller, A. F.—Photograph of *Epithelantha micromeris cristata* from Coahuila, Mexico..... 1

Weir, Dr. J. R.—Fungi on *Hevea* from Brazil..... 5

By Purchase—

Brandegee, T. S.—Plants of Mexico, collected by Doctor C. A. Purpus..... 220

Canton Christian College—Plants of China..... 390

Dusen, Dr. P.—Plants of Brazil..... 207

By Exchange—

Drushel, Prof. J. A.—Plants of United States and Canada 58

Field Museum of Natural History—Plants of Peru.... 83

Gray Herbarium, Harvard University—Plants of Prince Edward Island, California, Dutch Guiana, Venezuela, etc. 112

U. S. National Museum, Washington, D. C.—*Senecio* sp. from Chile..... 1

United States National Museum—Plants of eastern United States..... 57

By Field Work—

Greenman, Dr. J. M.—Plants of Franklin County, Missouri 2

Total 1,144

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director

BENJAMIN M. DUGGAR
Physiologist in charge of Graduate Laboratory

HERMANN VON SCHRENK
Pathologist

JESSE M. GREENMAN
Curator of Herbarium

EDWARD A. BURT
Mycologist and Librarian

EDGAR ANDERSON
Geneticist

JOANNE K. ARMSTRONG
Research Assistant

KATHERINE H. LEIGH
Secretary to the Director

NELL C. HORNER
Editor of Publications

G. H. PRING
Horticulturist

JOHN NOYES
Landscape Designer

PAUL A. KOHL
Floriculturist

EDGAR ANDERSON
In charge of School for Gardening

P. C. BRAWNER
Painter

J. CUTAK
Exotics

W. C. FAIRBANK
Plant Recorder

A. HUBER
Aquatics

J. H. KELLOGG
Herbaceous and Nursery

W. F. LANGAN
Engineer

J. LANGAN
Assistant Engineer

C. MCGOVERN
Outside Floral Display

D. MILLER
Orchids

G. NINTEMAN
Construction and Farms

J. ULRICH
Inside Floral Display

H. VALLENTINE
Carpenter

MISSOURI BOTANICAL GARDEN BULLETIN

Vol. XII SEPTEMBER, 1924 No. 7

CONTENTS

	Page
Poison Ivy	87
An Unusual Specimen of Trichopilia coccinea	91
Packing Orchids for Shipment	92
A Valuable Small Flowering Tree for St. Louis	93
Notes	95
Statistical Information	96

ST. LOUIS, MO.
1924

Published Monthly Except July and August by the Board of Trustees

SUBSCRIPTION PRICE:

ONE DOLLAR PER YEAR SINGLE COPIES TEN CENTS

BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

President

EDWARDS WHITAKER.

Vice-President

DAVID S. H. SMITH.

SAMUEL C. DAVIS.

EDWARD C. ELIOT.

GEORGE C. HITCHCOCK.

THOMAS S. MAFFITT.

EDWARD MALLINCKRODT.

A. C. F. MEYER.

PHILIP C. SCANLAN.

JOHN F. SHEPLEY.

EX-OFFICIO MEMBERS

HERBERT S. HADLEY,
Chancellor of Washington University

HENRY W. KIEL,
Mayor of the City of St. Louis

FREDERICK F. JOHNSON,
Bishop of the Diocese of Missouri

GEORGE T. MOORE,
President of The Academy of Science of St. Louis

HENRY A. ROSSKOPF,
President of the Board of Education of St. Louis

CHARLES A. ROE, Secretary.

SHOWING DAMAGE TO TREES AT THE GARDEN CAUSED BY WIND STORM OF JULY 17.

Missouri Botanical Garden Bulletin

Vol. XII SEPTEMBER, 1924 No. 7

POISON IVY

"About this time of year," as the almanacs say, expect ivy poisoning. Not that this unpleasant and sometimes serious malady may not be experienced at practically any time of year, but during the fall when people are prowling through the woods seeking for bright-colored leaves the chances of collecting the brilliant vines or shrubs of *Rhus Toxicodendron*, the common poison ivy of this region, are considerably increased. At other seasons of the year ivy poisoning is more or less accidental. In the fall it is frequently deliberate. This is due in part to the confusion which exists in the minds of many between the harmless Virginia creeper *(Parthenocissus quinquefolia)* and the true poison ivy, both of which are brilliantly colored at this time of year. To make matters worse, these two plants often grow side by side or intertwined with each other, and unless one has learned to distinguish between them disastrous results are apt to occur.

A few years ago, in England, poison ivy was put on the market as an ornamental plant under the trade name of *Ampelopsis Hoggii*, Ampelopsis being an old name for Virginia creeper. Masquerading under this name, the plant was employed as a vine by many unfortunate people. In one case, the climber grew up and surrounded a bedroom window and the occupants of the room, handling the foliage, were poisoned, with very serious results.

There is, however, no difficulty in distinguishing at once between the two plants, since the Virginia creeper always has five leaflets, while the poison ivy has but three. Any one

who can count up to five should always be able to avoid the dangerous plant (plate 24). It is true that the shape of the leaflets of the two plants is practically the same, but the difference in number furnishes an absolute guide. When the plants are in fruit an additional distinction is to be found, the Virginia creeper producing drooping bunches of purplish berries, while poison ivy bears erect clusters of somewhat smaller white berries.

Another plant to be avoided in the fall, especially when collecting colored leaves in swampy places is the poison sumac *(Rhus vernix)*. While this never grows as a vine, as does *Rhus Toxicodendron*, it may appear as a shrub only a few feet in height or a tree from fifteen to twenty feet high. The number of leaflets is of no assistance in separating the poison sumac from various other non-poisonous sumacs which have leaves turning red. Aside from the fact that any sumac growing in wet bogs is almost certain to be the poisonous one, the best distinguishing characteristic is its slender bunch of pale berries in contrast to the erect clusters of red or brown fruits of the harmless sumacs. Poison sumac to most people at least is more virulent in its action than is poison ivy.

On the Pacific coast is found the so-called "poison oak," which has sometimes been separated from the poison ivy of this region because of the shape of its leaves. Botanically, it is known as *Rhus diversiloba*, but it is a question whether it is entitled to a special name since it agrees very closely with our *R. Toxicodendron*.

There are, however, other species of the genus Rhus which are capable of producing symptoms similar to that of poison ivy, notably the one which is used in the manufacture of Chinese or Japanese lacquers. These lacquers are made from the sticky, brown sap which exudes from *Rhus verniciflua* when wounded. The recent epidemic of dermatitis among the devotees of Mah Jong was due to this poison. The varnish used on the tiles, although perfectly dry, is still capable, when handled, of giving off the irritating principle.

The Chinese, when working with this lacquer, have a typically quaint method of prophylaxis. They rub the hands and face with rape-seed oil, in which a ham has been boiled,

MAPLE TREE IN FRONT OF MAUSOLEUM, SHOWING LIMBS AND BRANCHES BLOWN OFF BY STORM OF JULY 17.

POISON-IVY GROWING IN ASSOCIATION WITH VIRGINIA CREEPER.
POISON-IVY AT LEFT, VIRGINIA CREEPER AT RIGHT.

wearing a linen mask for the face and a leather apron for the body when at work. After work the exposed parts are rubbed with a concoction of chestnuts, pine bark, saltpeter, and amaranth.

Much scientific investigation has been devoted to attempting to isolate and determine the character of the poison from poison ivy and related plants. While numerous ideas have been advanced from time to time, it is now pretty well established that the poisonous substance is a non-volatile oil, or yellowish brown viscous material, which must come in actual contact with the skin before the burning effect is produced. This does not necessarily mean that one must actually touch the plant, since the smoke from burning plants may carry the poison, and contact with articles of clothing, shoes, wagon and automobile tires, or anything that has passed through plants of poison ivy may sometime later be the cause of a case of poisoning in a person who is quite sure that he has been no place near the plant. Cases are on record where Christmas greens have carried the poisonous oil, although the poison ivy itself was not included in the shipment. Although it may not agree with what many who are subject to ivy poisoning regard as their experience, all the evidence points to the fact that the sap of the plant is the only part containing the poison and that those parts of the plant devoid of resin canals are harmless, thus eliminating as sources of the disease the anthers and pollen, the epidermis, and plant hairs.

It should also be remembered that many other plants are capable of producing a dermatitis that can scarcely be distinguished from that produced by a member of the genus Rhus. At least a hundred different plants are known to be responsible for producing eruptions on the skin and, while some of these effects are due to personal idiosyncracies, the fact remains that poison ivy and its near relatives should not have all the blame. At least three other types of disease of the skin caused by plant products are known in addition to that produced by species of Rhus. Perhaps the commonest is that produced by various stinging nettles. These plants are provided with hairs with small bulbous tips. A very slight touch is sufficient to break off the tip, leaving a finely pointed

hollow shaft like a hypodermic needle. A plant secretion is injected through this hair into the skin and, depending upon the nature of this secretion, the effect is either transitory or more or less serious. The sting of some of the tropical nettles has been known to cause either continuous pain, tetanus-like symptoms, or even death.

Another type of dermatitis is that known as "Primula poisoning," although there are a number of other plants besides primroses which produce practically the same effect. The irritant in this case is an oil which is secreted by glandular hairs all over the leaves and stem. The hairs are very delicate and easily broken and, in the case of susceptible individuals, may produce eruptions with more or less swelling accompanied by fever. The itching is so intolerable that where a considerable surface is involved, the loss of sleep and lack of appetite may rapidly wear out the patient.

Quite a different type of plant poisoning is the so-called "lily disease," which attacks particularly the flower pickers in the Scilly Islands, where daffodils and narcissus are grown in great quantities for the market. If the skin of the hands or arms of the workers is abraded in any way and the sap of the plant comes into contact with this abrasion it acts as a violent irritant, producing symptoms similar to ivy poisoning. Individual susceptibility is apparently a considerable factor in the development of this type of dermatitis, since some of the pickers escape entirely, others have but a single mild attack, while some are so susceptible that they dare not handle either the leaves or the flowers.

Remedies.—There are over two hundred and fifty published "cures" for poison ivy; and probably there are as many more which have been used in domestic practice. The fact that so many different remedies have been recommended is an indication of how futile the attempt to combat the effect of the ivy poison has been. Since the poisonous oil does not immediately penetrate the skin, the use of alcohol as a solvent or vigorous scrubbing with strong soap and water have been suggested as means of preventing the dermatitis when one knows he has been exposed to the plant. Of course, unless such a treatment is most thorough, the

SPRAY OF POISON-IVY AT LEFT, VIRGINIA CREEPER AT RIGHT.

TRICHOPILIA COCCINEA.

poison is simply spread on the surface of the skin and the after-effects are worse than if no attempt had been made to remove it.

Another line of attack has been to find some substance which would precipitate or neutralize the poison so that it no longer had an irritating effect, and lead acetate has been regarded as the substance best calculated to accomplish this. Theoretically, at least, an alcoholic solution of lead acetate, being a combined solvent and precipitant, should remove the poison before it has penetrated the skin. The latest treatment has been devised by Dr. McNair of Chicago University. Having isolated the toxic principle of *Rhus diversiloba,* to which he has given the name of lobinol, he was able to experiment with various substances and definitely determine whether or not they neutralized the effect of the irritant. As a result of this work he came to the conclusion that a five per cent solution of ferric chloride in a fifty per cent solution of ethyl alcohol was the mixture most suitable for this purpose. If the hands and face are bathed in this solution immediately after exposure to poison ivy, no ill effect follows. A strong solution of ferrous sulphate in water has also given good results.

The paraffin treatment which has been devised for burns is recommended to follow the application of the iron solution, when the case of ivy poisoning has progressed so far as to need special dressing. The use of ointments has a tendency to dissolve and spread the poison and consequently should be avoided. Washing with the ferric chloride solution, accompanied by a paraffin covering or a light dressing of absorbent cotton moistened with an aqueous solution of ferric chloride, is the only thing necessary.

AN UNUSUAL SPECIMEN OF TRICHOPILIA COCCINEA

Six plants of *Trichopilia coccinea* were presented to the Garden by Mr. C. W. Powell, the orchid enthusiast of Balboa, Canal Zone, from a lot collected personally by Mr. Powell. Among the plants was a pure albino form, but unfortunately

the label had become detached en route from the field and it was impossible to recognize it. Mr. Powell was anxious that the white form be included in the specimens coming to the Garden and after careful inspection the plant which was supposed to be the albino was cut in half, Mr. Powell retaining one piece and the other being included in the shipment to the Garden. The Garden likewise received a fine plant of *Trichopilia suavis* var. *alba* which flowered soon after its arrival in St. Louis and was described and illustrated in the May, 1924, number of the BULLETIN.

When the supposed white form of *T. coccinea* flowered it proved to be an unusually fine specimen of the typical *T. coccinea.* The extra large Cattleya-like flowers are of a deep carmine, the labellum being particularly striking because of the rich color of the throat. This plant was exhibited at the first show of the American Orchid Society, at Boston, in May, 1924, where it was universally acknowledged to be the best form of this species ever shown in this country. The variety may apparently be recognized by the larger-sized leaves and pseudobulbs and the darker foliage. Darker foliage is often associated with darker flowers, white or pale-colored flowers of the same variety usually being borne on plants with lighter-colored foliage. Gardeners not infrequently are able to select white forms of cannas, vincas, etc., before they have bloomed by this foliage characteristic.

PACKING ORCHIDS FOR SHIPMENT

One of the most important factors to be considered in packing orchids for shipment is proper aeration in order to prevent the damping-off of growth during transportation. With adequate ventilation plants will withstand long periods of drouth without any ill effect except in the shriveling of the pseudobulbs. Wild orchids are simply loosened, by the aid of machetes, from the branches of trees to which they are attached, and after being partially dried are packed as closely as possible into cases, without the use of any packing material. The shipping case is constructed in such a manner as

SHIPMENT OF ORCHIDS FROM ENGLAND, SHOWING METHOD OF PACKING.

LABURNUM ANAGYROIDES

to permit as free a circulation of air as possible. Spaces are left between the boards on all sides of the box, split bamboo canes being used at the ends when this material can be obtained. No skill is required in packing, since the only object is to get as many clumps as possible into each case. Usually the leaves of one plant are wedged between those of another, leaving the roots of individual clumps to come together. It is frequently necessary to have several natives stand on top of a case in order that the cover may be nailed on. After a trip of from one to three months the plants are naturally much shriveled. In the Cattleyas recently imported by the Garden from South America the plants lost practically one-half their weight during transit.

Hybrid orchids shipped by growers in England are packed in quite a different way. Three cases of these imported by the Garden from England last June contained 130 plants, each in its original pot. These were packed with such care that not a pot or young growth was broken. Each pot was wrapped with excelsior and the leaves and pseudobulbs of the plant secured to a stick which extended well above the top of the plant. After being prepared in this way the plants were placed in rows at either end of the box and each row secured by a wooden strip nailed from the exterior of the box. The stick to which the leaves and pseudobulbs were fastened extended parallel to the stick securing the opposite plant, to which they were again fastened, thus bracing one against the other and preventing any possible shifting. The method of packing in the cases is illustrated in plate 26, which shows one of the cases with a side removed, immediately upon its arrival at the Garden.

A VALUABLE SMALL FLOWERING TREE FOR ST. LOUIS

During the spring of 1916 two plants of *Laburnum anagyroides* were imported from Europe to complete the collection of Shakesperean plants to be exhibited in the floral display house on the occasion of the tercentenary celebration of Shakespeare's death. These small leguminous trees, commonly called Laburnum, or "golden chain," because of the

long pendants of yellow flowers, have been used in England for many years, where they are so popular that they are found in almost every garden.

The plants brought to St. Louis were forced into bloom in the greenhouse and subsequently placed outside for the summer. Because it was not anticipated that they would prove hardy in this climate, they were stored in a cool greenhouse during the winter, but the following year they remained outside for the entire twelve months, being protected only by a lath house. There being no sign of winter killing, a further test was made in the spring of 1921 when both trees were permanently planted in the shrubbery border west of the rose garden. The following spring both plants flowered profusely. This past winter, when so many so-called hardy shrubs were frozen back to the ground, was a particularly severe test upon the laburnums. However, neither plant was seriously damaged, only the tips of some of the branches freezing back eight or ten inches. With the copious rains of this spring, the old branches produced abundant new wood during the summer.

In view of the unusually severe conditions to which the plants at the Garden have been subjected during the past three or four years, it would seem safe to recommend this most beautiful of the small flowering trees for the gardens of St. Louis and vicinity.

The laburnums, of which there are three species, natives of southern Europe and western Asia, grow from twenty to thirty feet high and have dark green trifoliate leaves which fall in late autumn without changing color. While they present a neat appearance throughout the year, the long drooping racemes of yellow flowers which hang from the small branches in the spring are their chief attraction. Planted in distinct groups in separate locations instead of dotting them about haphazard, they are a most pleasing addition to the landscape. In association with dark-colored foliage, such as the copper beech, they afford one of the most satisfactory combinations which can be devised for this sort of planting. The genus is rarely seen in the Middle West because it is not regarded as capable of standing the extremes of temperature

OBVERSE AND REVERSE OF MEDAL AWARDED TO THE GARDEN AT THE FIRST ANNUAL SHOW OF THE AMERICAN ORCHID SOCIETY IN BOSTON, MAY 8-11, FOR HAND-COLORED PHOTOGRAPHS ILLUSTRATING ORCHID COLLECTING.

SILVER CUP AWARDED TO THE GARDEN AT THE FIRST ANNUAL SHOW OF THE AMERICAN ORCHID SOCIETY.

which frequently obtain in this vicinity. They are adapted to both sun and shade, and the Scotch laburnum, *L. alpinum*, which flowers two or three weeks later than *L. anagyroides*, is said to be even hardier than this latter species. The young flowers are reported to be poisonous if taken internally, and it is probable that all parts of the tree contain some toxic principle. The hard, tough, and closely grained wood is susceptible to a very high polish and in Europe is manufactured into various small articles. Plants may be raised from seed, but this practice is not advised since it frequently results in most inferior trees. Small trees propagated by budding, grafting, or layering should be easily obtained from reliable nurserymen who sell them under various horticultural names.

NOTES

Mr. G. H. Pring, Horticulturist to the Garden, gave the lecture, "Collecting Orchids in South America," before the junior order of United American Mechanics, September 22.

Dr. George T. Moore, Director of the Garden, represented Washington University at the meetings of the British Association for the Advancement of Science, held in Toronto, August 6-13.

Dr. B. M. Duggar, Physiologist to the Garden, lectured before the Kelton Farmers' Club, Kelton, Pa., on "Fungous Diseases as a Farm Problem."

Dr. B. M. Duggar gave a course of twelve lectures on physiological plant pathology to graduate students attending the summer session of the department of botany, University of Chicago.

Dr. B. M. Duggar lectured before the botanical conference, University of Chicago, July 14 on "The Significance of Cell Inclusions in Virus Diseases"; he also presented a paper before the plant physiology seminar on "Ultra-filtration and Its Application in Physiological Research."

Dr. B. M. Duggar has been appointed vice-chairman of the division of biology and agriculture of the National Research Council for 1924-1925, also representative in the National Research Council of the section of physiology of the Botanical Society of America.

STATISTICAL INFORMATION FOR JUNE-AUGUST, 1924

GARDEN ATTENDANCE:

Total number of visitors in June 22,085
Total number of visitors in July 24,334
Total number of visitors in August 35,860

PLANT ACCESSIONS:

Total number of plants and seed packets received as gifts in June 131
Total number of plants and seed packets received as gifts in July 74
Total number of plants and seed packets received as gifts in August 25
Total number of plants received in exchange in August.. 24

PLANT DISTRIBUTION:

Total number of plants distributed as gifts in June..... 12

LIBRARY ACCESSIONS:

Total number of books bought in June..... 42
Total number of books and pamphlets donated in June.. 190
Total number of books and pamphlets bought in July... 21
Total number of books and pamphlets donated in July.. 58
Total number of books and pamphlets bought in August 13
Total number of books and pamphlets donated in August 187

HERBARIUM ACCESSIONS:

JUNE

By Gift—

Allen, Mrs. C. C.—*Sarcodes sanguineus* Torr..... 1
Armstrong, Dr. and Mrs. Geo. M.—Plants of Florida.. 43
Ashe, W. W.—*Crataegus monosperma* Sarg. from Missouri 1
Drushel, Prof. J. A.—Plants of Vermont, Massachusetts, New York, New Jersey, Missouri and Colorado.. 38
Drushel, Prof. J. A.—Plants of Argentina..... 80
Horling, Mrs. E. P.—*Oenothera triloba* Nutt. var. *parviflora* Wats. from Kansas..... 1
McFarland, Prof. Frank T.—*Helianthus kentuckiensis* McFarland & Anderson from Kentucky..... 1
Parker, John H.—*Aegilops* sp..... 1
Peterson, Mrs. D. P.—Cultivated specimen of *Feijoa Sellowiana* Berg. from Texas..... 1

By Purchase—

Broadway, W. E.—Plants of Trinidad, B. W. I..... 248
Henderson, Prof. L. F.—Plants of Oregon..... 440
Koch, Max—Plants of Australia..... 200

By Exchange—
Hungarian National Museum—Plants of Hungary..... 500
U. S. National Museum—Plants of Salvador..... 474

2,029

JULY

By Gift—
Boyce, Dr. J. S.—*Fomes Hartigii* and *Cronartium pyriforme* from Oregon..... 2
Grover, Prof. F. O.—Plants of California..... 170
von Schrenk, Dr. Hermann—*Equisetum hyemale* L. from Michigan 1

By Exchange—
U. S. National Museum, by Dr. J. N. Rose—Cacti from Lower California, chiefly type material..... 13

186

AUGUST

By Gift—
Bijl, P. A. van der—Fungi of Transvaal, South Africa.. 15
Conzatti, Prof. C.—*Habenaria* sp. from Mexico..... 1
Greenman, Dr. J. M.—*Potentilla tridentata* Ait. from Massachusetts 1
Larner, R. H.—*Cuscuta* sp. from Illinois..... 1
Saeger, A. C.—*Lemna* from Missouri and Nebraska... 4

By Purchase—
Holzinger, John M.—Musci acrocarpi Boreali-Americani, Fasc. 21, Nos. 501-525 incl..... 25
Stewart, R. R.—Plants of Punjab and Kashmir, British India 765
Sydow, H.—Mycotheca germanica, Fasc. XLII-XLV, Nos. 2051-2250 incl..... 200

By Exchange—
Botanical Museum, University of Cluj, Roumania—Plants of Roumania—Flora Romaniæ exsiccata, Centuria III, Nos. 201-300..... 100

1,112

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director

BENJAMIN M. DUGGAR
Physiologist in charge of Graduate Laboratory

EDGAR ANDERSON
Geneticist

HERMANN VON SCHRENK
Pathologist

LIONEL E. TISDALE
Research Assistant

JESSE M. GREENMAN
Curator of Herbarium

KATHERINE H. LEIGH
Secretary to the Director

EDWARD A. BURT
Mycologist and Librarian

NELL C. HORNER
Editor of Publications

G. H. PRING
Horticulturist

PAUL A. KOHL
Floriculturist

JOHN NOYES
Landscape Designer

EDGAR ANDERSON
In charge of School for Gardening

P. C. BRAWNER
Painter

J. LANGAN
Assistant Engineer

J. CUTAK
Exotics

C. MCGOVERN
Outside Floral Display

W. C. FAIRBANK
Plant Recorder

D. MILLER
Orchids

A. HUBER
Aquatics

G. NINTEMAN
Construction and Farms

J. H. KELLOGG
Herbaceous and Nursery

J. ULRICH
Inside Floral Display

W. F. LANGAN
Engineer

H. VALLENTINE
Carpenter

MISSOURI BOTANICAL GARDEN BULLETIN

Vol. XII OCTOBER, 1924 No. 8

CONTENTS

	Page
Some Valuable Members of the Mint Family	99
Frost Flowers	104
Notes	105
Statistical Information	106

ST. LOUIS, MO.
1924

Published Monthly Except July and August by the Board of Trustees

SUBSCRIPTION PRICE:

ONE DOLLAR PER YEAR SINGLE COPIES TEN CENTS

BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

President

EDWARDS WHITAKER.

Vice-President

DAVID S. H. SMITH.

SAMUEL C. DAVIS.

EDWARD C. ELIOT.

GEORGE C. HITCHCOCK.

THOMAS S. MAFFITT.

EDWARD MALLINCKRODT.

A. C. F. MEYER.

PHILIP C. SCANLAN.

JOHN F. SHEPLEY.

EX-OFFICIO MEMBERS

HERBERT S. HADLEY,
Chancellor of Washington University

HENRY W. KIEL,
Mayor of the City of St. Louis

FREDERICK F. JOHNSON,
Bishop of the Diocese of Missouri

GEORGE T. MOORE,
President of The Academy of Science of St. Louis

JOHN C. TOBIN,
President of the Board of Education of St. Louis

CHARLES A. ROE, Secretary.

VIEW OF AQUARIUM EXHIBIT IN THE FLORAL DISPLAY HOUSE AT THE GARDEN, SEPTEMBER 14.

Missouri Botanical Garden Bulletin

Vol. XII OCTOBER, 1924 No. 8

SOME VALUABLE MEMBERS OF THE MINT FAMILY

The discovery by a Japanese that a substance obtained from Perilla, one of the mint family, is two thousand times sweeter than sugar, again calls attention to the economic importance of this group of plants. The best that the chemists have been able to do in obtaining something sweeter than sugar is saccharin which is one of the numerous coal-tar derivatives and, depending upon the dilution, is from two to seven hundred times sweeter than sugar.

The Labiatae, or mint family, embraces over three thousand species widely distributed in warm and temperate regions. Botanically, they are characterized by having square stems, opposite leaves, whorls of lipped flowers, and deeply four-lobed dry fruits. They are sometimes of great beauty, a notable example being the salvia cultivated in the garden. The family is devoid of any harmful properties and is especially valuable on account of the volatile oils which many of its species yield.

The term mint, often applied more or less indiscriminately, is most frequently used to designate plants of the genus Mentha. The name is derived from a Greek nymph, Mintha, who was supposed to have been metamorphosed by Proserpine into the herb afterwards named for her. About thirty species of Mentha are now recognized, most of which are either native or are now naturalized in North America. The peppermint (*M. piperita*) is most important economically because of the various uses to which is put the essential oil obtained from

it. A native of Great Britain, it was cultivated by the Romans, but there is no record of it in America previous to its introduction in Connecticut in the early part of the eighteenth century. In 1835 the roots were taken from Ohio to Pigeon Prairie, in Michigan, where at the present time the peppermint industry has grown to large proportions. It is also cultivated extensively in England and in Saxony.

The crop is usually cut in August and September, when the earliest flowers have developed but before the leaves have fallen. During favorable seasons a second crop is sometimes harvested in November. After cutting, the plants are cured in a manner similar to that for hay, then raked into windrows and taken to the still, where the oil is extracted. The average yield of oil is about twenty-five pounds per acre for the black mint, the variety now most extensively grown, although it may be as high as sixty pounds per acre and as low as ten pounds per acre.

There are three recognized kinds of peppermint: the American mint of New York (*M. piperita*), the black mint or black mitcham (*M. piperita* var. *vulgaris*), a more productive variety introduced from Mitcham, England, about 1889, and the white mint or white mitcham (*M. piperita* var.*officinalis*), which produces a superior grade of oil but with smaller yield. Other varieties of the genus include spearmint (*M. spicata*), pennyroyal (*M. Pulegium*), the popular name flea-bane suggesting its use, bergamot mint (*M. citrata*), round-leaved mint (*M. rotundifolia*), American wild mint (*M. canadensis*), and the Japanese mint (*M. arvensis* var. *piperascens*).

In the early days efforts were made to obtain seed of varieties of mints which would produce the largest quantity of volatile oil of the strongest quality, it being recognized that cultivation had greatly improved the wild forms. Henry Dethicke, in the "Gardeners' Labyrinth," gives some curious advice to those who cannot procure cultivated plants: "Let him plant the seed of the wild mint, setting the sharper ends downwards whereby to tame and put away the wildness of them."

Another member of the mint family, though not belonging to the genus Mentha, is lavender (*Lavendula vera*). This is

a native of the Mediterranean region, but the oil obtained from plants grown at Mitcham, near London, is considered the finest and demands the highest price. During the picking season, thousands of men and women leave London to assist in harvesting the crop. The dried spikes are frequently sold on the street, both in this country and abroad, and in London peddlers attract attention to their wares by the famous lavender song:

"Here's your sweet lavender,
Sixteen sprigs a penny,
Which you will find, my ladies,
Will smell as sweet as any."

Lavender-water was formerly used as a toilet article and many old recipes for its preparation are in existence. That of Richard Briggs, for many years cook at the Globe Street Tavern, Flint Street, London, is as follows: "Put two pounds of lavender pips in two quarts of water, put them into a cold still and make a slow fire under it. Distil it off very slowly into a pot until you have distilled all the water. Then clean your still well off, put your lavender-water into it and distil it off slowly again. Put it into bottles and cork it well." Another recipe from the still-room of Mrs. Charles Roundell, for making lavender-water without distillation, reads as follows: "Mix one pint rectified spirits, four ounces distilled water, three drams oil of lavender, three drams orange-flower water, five minnins attar of roses. Allow this mixture to stand for a fortnight then filter through carbonate of magnesia and bottle. Keep for three months before using." Lavender tea was made by pouring boiling water on the sprigs of dried lavender, and the cook to Queen Maria, in 1655, gives the following recipe for a conserve of the flowers: "Take the flowers, being new, as many as you please, and beat them with three times their weight of white sugar, after the same manner as rosemary flowers. They will keep one year."

According to tradition, Marjoram was a youth in the service of King Cimyras of Cyprus. One day, while carrying a vase of perfumes, he stumbled and fell and, in his terror,

lost consciousness. Venus, seeing this, took pity upon him and changed him into a sweet herb which we now know as sweet marjoram. This plant (*Origanum Majorana*) is a native of the Mediterranean countries. It has a pleasant odor and aromatic, bitter taste. Due to the volatile oil which it contains, the green plants are used for seasoning soups, stews, etc., and it was formerly employed as a domestic medicine to "bring out the rash" in such diseases as measles.

The Japanese have long used the oil obtained from Perilla seeds in saturating paper to use for the walls of rooms, bookbinding, etc. This "Yegoma" oil is also used in waterproofing paper for umbrellas and for window panes. The sweet compound obtained from this plant was first made in Germany, but it was not until ten years later that its excessive sweetness was discovered by a Japanese. Whether this "Alpha-anti-aldoxime of perillaldehyde" will ever be of any commercial value remains to be seen, but the plant Perilla is easily grown, frequently occurring wild in the vicinity of St. Louis, and the fact that one pound of this sweetening will go as far as a ton of sugar would seem to make it well worth considering.

A sweet herb of southern Europe, used for seasoning and sometimes in the household practice of medicine, is sage (*Salvia officinalis*). The common name is derived from its supposed power of strengthening the memory and consequently increasing one's wisdom. For the last three hundred years this shrubby perennial has been widely cultivated in kitchen gardens for its aromatic leaves. It is more extensively grown in America than any other culinary herb with the exception of parsley, which is largely used for garnishing rather than as a flavoring agent. Only the young leaves of sage should be used, as fresh as possible, for unless carefully dried, they lose the volatile oil which is the source of their flavor and aroma. In ancient medicine they were credited with various medicinal properties.

Thyme (*Thymus vulgaris*) is another herb that has been much used for culinary purposes, recipes for thyme tea dating back to 1600. The volatile oil from this plant contains

from twenty to twenty-five per cent of thymo, still used medicinally.

Patchouli (*Pogostemon Heyneanus*), a shrub native of India, was formerly used much more extensively than now in perfumes. Valuable Indian shawls used to be distinguished by their odor of patchouli, but this can no longer be considered an evidence of their genuineness. At one time it had considerable vogue in confections belonging to the "breath-killer" class.

The common hoarhound (*Marrubium vulgare*), a perennial woolly herb, is now found in most parts of the world, having escaped from cultivation. The leaves and flowering tops are used in large quantities in the making of confections for coughs and colds.

Hyptis spicigera is an annual native to the warmer parts of America and is also widely spread in tropical Africa. The seeds, which yield an oil, have occasionally been imported to Europe both from the east and west coasts of Africa, but the oil has never been of much commercial value.

Plectranthus madagascariensis, a native of Madagascar, and *Coleus parviflorus*, a native of Java, have both been cultivated as articles of food.

The Chinese artichoke (*Stachys Sieboldii*) has likewise been widely grown for its crisp tubers which may be eaten either raw or cooked. It was first introduced into France from Pekin in the early eighties, but has now become naturalized in the United States, being hardy as far north as central New York.

While perhaps most of the more important members of the mint family have been mentioned, there are still a number of others which in one way or another have been used by man. Several species of *Monarda*, known as horsemint or wild bergamot, have found a place in medicine, and the "tollsi" (*Ocimum sanctum*) is held in great veneration in India, where it is extensively cultivated. The roots are made into rosaries, which are worn about the necks and arms of the Brahmans. The leaves are also used in making a decoction which is supposed to be a cure for certain fevers. In Australia, the dried leaves have been used for making "bush-tea."

FROST FLOWERS

So-called "frost flowers" are such striking and beautiful objects that to one who observes them for the first time they are regarded as being something rare and perhaps not even previously known. But just a hundred years ago Stephen Elliot in "A Sketch of the Botany of South Carolina and Georgia" wrote of the marsh fleabane:

> **"This plant exhibits frequently a remarkable phenomenon. In every cold frosty morning during the winter, crystalline fibers nearly an inch in length shoot out in every direction from the base of the stem. It would appear as if the remnant of the sap or water, absorbed by the decayed stem, had congealed, and had burst in this manner through the pores of the bark. Does this proceed from any essential quality of the plant, or from its structure?"**

Since Elliot's time many scientists have made similar observations and concerned themselves in attempting to explain the cause. Sir John Hershell, in 1883, recorded the fact that the stalks of thistle and heliotrope produced formations of ice crystals, and up to the present time at least thirty different plants have been recorded as forming frost flowers, including not only herbaceous annuals and perennials, but trees, such as walnut, pawpaw, Paulownia, etc. These crystals sometimes take the form of single columns on the surface of cut portions of the plant, or they burst through the bark, producing all sorts of fluted flanges and ridges. The accompanying plates, from photographs taken in the Garden, show shell-like structures of ice of pearly whiteness, curled in every variety of form, not unlike the petals of a flower.

While ice crystals are by no means confined to a single species, as has sometimes been supposed, there are only a comparatively few plants in which this phenomenon can take place. The roots must retain their vitality long after the stems have died, and continue to force up water which either freezes on a cut or wound or finds some other outlet through the bark. The tendency of stems to contract in cold weather, squeezing out any surplus of water present, may likewise be a factor in the formation of ice crystals, although this is not the case in those illustrated in the accompanying plates.

FROST FLOWERS PRODUCED ON PRUNED STEMS OF CROWNBEARD (VERBESINA VIRGINICA).

FROST FLOWERS.

When water is forced out of the plant into a temperature below freezing it forms lines of ice which may soon become flat plates as the already-formed ice is pushed out ahead of the water. But it is only a peculiar combination of circumstances which makes the formation of these crystals possible. The soil must contain a sufficient amount of water and the temperature in the soil as well as in the conducting tissues of the plant must be above the freezing point, while the temperature of the air must be below the freezing point. With all these conditions favorable, frost flowers are not infrequently produced on the ends of cut stems of the crown beard (*Verbesina virginica*) along the path near the south end of the main conservatory at the Garden. Plates 31 and 32 show well the striking appearance of these ice flowers. Perhaps the best-known plant producing these structures is *Helianthemum canadense*, commonly called "frost weed," which is referred to in Gray's "Manual" as follows: "Late in autumn crystals of ice shoot from the cracked bark at the root, whence the popular name."

NOTES

Mr. George H. Pring, Horticulturist to the Garden, lectured on "Fall Planting" before the Edwardsville Wednesday Club, at the High School, Edwardsville, Illinois, October 3.

Dr. George T. Moore, Director of the Garden, represented the Missouri Botanical Garden and Washington University at the dedication of the Boyce Thompson Institute for Plant Research, at Yonkers, New York, September 24.

Dr. Vernon H. Blackman, professor of botany, Imperial College of Science and Technology, University of London, England, visited the Garden, October 23, and in the afternoon addressed the graduate seminar on "Physiology of Parasitism." In the evening he delivered a lecture before the Academy of Science on "The Effect of Electricity on the Growth of Plants."

Recent visitors to the Garden include Prof. Delzie Demarer, of Hendrix College, Conway, Arkansas; Dr. William S.

Cooper, assistant professor of botany, University of Minnesota; Prof. C. V. Piper, of the Bureau of Plant Industry, U. S. Department of Agriculture; and Dr. M. J. Dorsey, professor of horticulture, University of West Virginia.

STATISTICAL INFORMATION FOR SEPTEMBER, 1924

GARDEN ATTENDANCE:

Total number of visitors	36,265

PLANT ACCESSIONS:

Total number of seed packets received as gifts	68
Total number of plants received as gifts	192

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	50
Total number of books and pamphlets donated	71

HERBARIUM ACCESSIONS:

By Gift—

Epling, Dr. Carl—Plants of California	2
Peltier, Dr. G. L.—*Hydnum* sp. from Arizona	1
Rigg, Prof. George B.—*Lycopus uniflorus* Michx. from Washington	1
Welch, Miss Winona W.—*Allium Scorodoprasum* L. from Indiana	1

By Field Work—

Allen, Cyril—Plants of Colombia, South America	300
Total	305

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director

BENJAMIN M. DUGGAR
Physiologist in charge of Graduate Laboratory

EDGAR ANDERSON
Geneticist

HERMANN VON SCHRENK
Pathologist

LIONEL E. TISDALE
Research Assistant

JESSE M. GREENMAN
Curator of Herbarium

KATHERINE H. LEIGH
Secretary to the Director

EDWARD A. BURT
Mycologist and Librarian

NELL C. HORNER
Editor of Publications

G. H. PRING
Horticulturist

PAUL A. KOHL
Floriculturist

JOHN NOYES
Landscape Designer

EDGAR ANDERSON
In charge of School for Gardening

P. C. BRAWNER
Painter

J. LANGAN
Assistant Engineer

J. CUTAK
Exotics

C. MCGOVERN
Outside Floral Display

W. C. FAIRBANK
Plant Recorder

D. MILLER
Orchids

A. HUBER
Aquatics

G. NINTEMAN
Construction and Farms

J. H. KELLOGG
Herbaceous and Nursery

J. ULRICH
Inside Floral Display

W. F. LANGAN
Engineer

H. VALLENTINE
Carpenter

Missouri Botanical Garden Bulletin

Vol. XII NOVEMBER, 1924 No. 9

CONTENTS

	Page
Henry Shaw (A Biography)	107
Notes	124
Statistical Information	124

ST. LOUIS, MO.
1924

Published Monthly Except July and August by the Board of Trustees

SUBSCRIPTION PRICE:

ONE DOLLAR PER YEAR SINGLE COPIES TEN CENTS

BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

President

EDWARDS WHITAKER.

Vice-President

DAVID S. H. SMITH.

SAMUEL C. DAVIS.

EDWARD C. ELIOT.

GEORGE C. HITCHCOCK.

THOMAS S. MAFFITT.

EDWARD MALLINCKRODT.

A. C. F. MEYER.

PHILIP C. SCANLAN.

JOHN F. SHEPLEY.

EX-OFFICIO MEMBERS

HERBERT S. HADLEY,
Chancellor of Washington University

FREDERICK F. JOHNSON,
Bishop of the Diocese of Missouri

HENRY W. KIEL,
Mayor of the City of St. Louis

GEORGE T. MOORE,
President of The Academy of Science of St. Louis

JOHN C. TOBIN,
President of the Board of Education of St. Louis

CHARLES A. ROE, Secretary.

HENRY SHAW, ABOUT 1865

Missouri Botanical Garden Bulletin

Vol. XII NOVEMBER, 1924 No. 9

HENRY SHAW[1]

Like most of the world's benefactors, Henry Shaw has left scanty material for the biographer. A life prolonged far beyond the ordinary term, and full of active effort almost from beginning to end, was singularly uneventful—"Keeping the noiseless tenor of its way" from birth to death with little to break, nothing to seriously disturb, its even current. He was a public man only through his labors for the public good. He held no office of any kind, was never a prominent figure in state or municipal affairs, and by choice as well as natural temperament was essentially a private citizen. Even when his benefactions had made him famous abroad as well as at home, he remained the same modest and retiring gentleman; seeking no honor, caring for no praise—anxious only that his works should live and speak for him when he had gone. And his life was so completely identified and blended with these works, that they will ever be the best and all-sufficient biography of him.

Henry Shaw was born in Sheffield, England, July 24, 1800. His father, Joseph Shaw, was a native of Leicester, but removed to Sheffield at a very early age. The mother, Sarah Hoole, whom he most resembled in disposition, was a native of that city. Henry was the oldest of four children. One son died in infancy, and two daughters are still living: Miss

1 Because of numerous requests for a life of Henry Shaw, the following biographical sketch prepared by Mr. Thomas Dimmock is reprinted from the First Annual Report of the Garden, published in 1890.

Sarah Shaw, in Rochester, New York, at the age of 86, and Mrs. Caroline Morisse, in St. Louis, at the age of 84. The father was a manufacturer of grates, fire-irons, etc., and had a large establishment in Green Lane, Sheffield, which was afterwards removed to Roscoe Place; both of which sites have long since disappeared before the advancing tide of brick and mortar. Probably the earliest recollections of the boy were associated with the factory and warehouse, but he showed no tendency to tread in the paternal footsteps in that respect; though the business habits and methods he was thus brought in contact with at the period when the mind is "wax to receive and marble to retain," were of inestimable service to him at a later day.

His primary education was obtained at Thorne, a village not far from his native town; and his favorite place for study, we are told, was an arbor, half-hidden by blossoming vines and surrounded by trees and flowers. He seems to have been a lover of these from childhood, and with his two sisters passed many happy hours in the little garden attached to the family residence; "planting and cultivating anemones and ranunculus," as he remembered and told after the lapse of nearly eighty years.

From Thorne he was transferred to Mill Hill, about twenty miles from London. It was what is termed in England a "Dissenting" school, the elder Shaw being a Baptist; but was considered among the best private institutions of learning in the Kingdom. Here he remained some six years, leaving probably in 1817; and here he finished that part of his education which schools could give—the education that taught him how to educate himself in the long and busy life upon which he was soon to enter. Mill Hill gave him an average knowledge of the classics, less of Greek than of Latin; and more than an average knowledge of mathematics, which he developed by subsequent study, for the mere love of the science apparently. He was for a long time regarded as the best mathematician in St. Louis. At both schools he was taught French, and became in later years an excellent French scholar; speaking, reading and writing it with as much ease and correctness as English. He was

especially fond of French literature, and his library is quite rich in the standard authors as well as lighter works. Undoubtedly, he was introduced at Mill Hill to other modern languages: German, Italian and Spanish—all of which (except perhaps German) he followed up more or less until the last years of his life; as well-thumbed grammars and dictionaries, and a good selection of Italian and Spanish books, abundantly prove.

With this preliminary equipment the boy took his place in the ranks of men by assisting his father at the home establishment for a year, and then—in 1818—came with him to Canada. His manly qualities must have shown themselves unmistakably by that time, for the same year his father sent him to New Orleans; mainly, it is understood, with the object of learning the mysteries of cotton-raising, though other business of no great consequence required his presence there. But his stay in Louisiana was short; he did not like the climate, nor were there any present or prospective financial inducements to remain. He was now his own master, and decided to exchange the South for the North and try his fortune in the then small and remote French trading post called St. Louis. Embarking on the "Maid of New Orleans," after a long and tedious voyage the youthful adventurer arrived at his destination May 3, 1819. A venerable citizen—Mr. Frederick L. Billon—saw the steamer come to anchor at the foot of what is now Market Street, and was among the first to welcome the stranger. He says: "Mr. Shaw had come from England with a small stock of cutlery, to make his fortune in the New World. With little means he began business on the second floor of a building which he found for rent, and for a time lived, cooked, and sold his goods in this one room. I have sat with him there many a time, playing chess during the long evenings. He cared little for society, and while he went out to parties and balls occasionally, he seemed to avoid making acquaintances among the girls of that period. The reason of this was [so thinks Mr. Billon] that he had come to make money solely, with the expressed intention of some day returning to his native heath to enjoy the result of his early years of labor. He intended marrying some

English girl, and for that reason avoided making female friends, fearing he might fall in love and thus spoil his well-defined plans.''

The capital which bought the ''small stock of cutlery'' and gave the young man his first start in life, was furnished by his uncle, Mr. James Hoole, who lived to see the splendid success of the perilous investment, and for whose memory his nephew cherished the profoundest respect.

While, very naturally and properly, the main object of Mr. Shaw at this the decisive period of his career was to ''make money,'' and thereby secure that financial independence necessary for the accomplishment of higher purposes, and while in order to do this he willingly denied himself many youthful enjoyments, he did not push his prudent self-denial beyond reasonable limits. Then and always he knew how to harmonize business and pleasure, how to use both without abusing either, and so to obtain the benefits of both with the fewest possible disadvantages. He never believed in the popular American doctrine of ''all work and no play,'' nor did he adopt the equally foolish American idea which postpones the play until work has destroyed all desire for it. He had his time for business and his time for pleasure, and never allowed one to interfere with or encroach upon the other. St. Louis in those days was small in population, but large enough in the material for social enjoyment. The dominant element was French; with all that the name implies in warm hospitality, simple courtesy, fondness for innocent amusement, and that invincible light-heartedness which no care or trouble, however heavy, can altogether subdue. His knowledge of the language was no less useful in social than in commercial affairs, and combined with uniform politeness and entertaining conversation soon made him as much at home in this little fragment of far-away France as if he were a Frenchman born. The finest garden in St. Louis then belonged to Madame Rosalie Saugrain; and her daughter—the late Mrs. Henry Von Phul—remembered how the young Englishman, on his daily afternoon horseback rides into the open country beyond what is now Seventh Street, would stop at the garden fence, admire the beautiful flowers, and exchange pleasant

words with the accomplished lady who had brought the manners and tastes of Paris into the wilds of western America. These were probably Mr. Shaw's happiest years, to which he always looked back with fullest appreciation of the blessings they bestowed upon him. He had youth, health, friendship, agreeable associations and surroundings; everything except wealth—and that was rapidly coming. Natural business ability of a high order, united with strictest integrity, unrelenting energy, rigid economy and close personal attention, were producing their appropriate fruit.

When the balance sheet for 1839 was struck it showed, to the great surprise of Mr. Shaw, a net gain for the year of $25,000. He could not believe his own figures, and so went over them again and again until he could no longer doubt the fact. Telling the story many years afterwards he said it seemed to him then that "this was more money than any man in my circumstances ought to make in a single year," and he resolved then and there to go out of active business at the first good opportunity. The opportunity presented itself very early in the following year, and was promptly improved by the sale of his entire stock of merchandise. So at forty years of age—only the noon of life—with all his physical and mental powers unimpaired and vigorous, Henry Shaw was a free man—and the possessor of $250,000 (equivalent to $1,000,000 in our day) with which to enjoy that freedom. The practical philosophy—usually called common sense, because perhaps it is so very uncommon—which was the ruling feature of his character, was never more clearly and happily displayed than in this retirement. To it he owed what has secured him grateful and generous remembrance forever; to it we, and those who will come after us, owe the rare and precious gifts of perfected Nature whose "infinite variety age cannot wither nor custom stale."

In September, 1840, Mr. Shaw made his first visit to Europe, stopping on the way at Rochester, N. Y., where his parents and sisters resided. The youngest sister, now Mrs. Morisse, accompanied him to England, from whence, after a lengthy stay among relatives and friends, he proceeded alone to the Continent for an extended tour. Returning to

St. Louis in the autumn of 1842, he arranged his affairs for another absence in Europe which lasted about three years; during which time he visited all the then accessible European localities, together with Constantinople and Egypt. A contemplated journey to Palestine was arrested by the prevalence of the plague. The journals kept and letters written in the course of these two absences abroad show, what might have been expected, that Mr. Shaw did not travel merely for the sake of traveling, but to see and hear what was most worth seeing and hearing; or, in other words, to acquire that invaluable education which only such intelligent and observing travel can afford. The broad, comprehensive, impartial views of men and things with which he thus supplemented the knowledge drawn from books and from personal experience, may be regarded as completing the culture of his maturer life. Thenceforth he was, in the best sense of the phrase, a man of the world; a cosmopolitan rather—who though living by preference in America, could have been equally at home in any other civilized country.

Early in 1851 Mr. Shaw went abroad for the last time, drawn thither by the first World's Fair, then being held in London. This final visit has a special and peculiar interest to us from the fact that out of it grew, indirectly, the Missouri Botanical Garden and Tower Grove Park. According to his own statement, it was while walking through the grounds of Chatsworth—the most magnificent private residence in Europe—that the fruitful idea first dawned upon him. He said to himself: "Why may I not have a garden too? I have enough land and money for something of the same sort in a smaller way." That idea could not have had a more lovely or more appropriate birthplace than the spot upon which the herditary chiefs of the great house of Devonshire have for nearly three hundred years lavished all the resources of ample wealth and cultivated taste; the historic domain which William the Conqueror gave to his natural son, William Peveril; which Sir William Cavendish bought, and began to improve, in the reign of Elizabeth; which for thirteen years was the prison of Elizabeth's cousin and enemy, Mary, Queen of Scots; which before and since

has been famous in English song and story, and which today is a sight well worth crossing the ocean to see.

Mr. Shaw returned in December, 1851. The mansion at Tower Grove had been finished in 1849 and the one at the corner of Seventh and Locust streets was then being built. From this time forward he was in St. Louis, with the exception of short summer vacations at the Atlantic coast or the Northern lakes. Apparently a man of elegant leisure, he was in reality a very busy man for the next thirty years. An idler he never was until physical weakness compelled him to be such. The idea born at Chatsworth was developing and taking shape.

In 1857 the late Dr. Engelmann, then in Europe, was commissioned in a general way by Mr. Shaw to examine botanical gardens and obtain such suggestions as he might deem of value. The Missouri Garden was begun, by trenching and other preliminary preparation, in that year. About the same time a correspondence was begun with Sir William J. Hooker, then Director of Kew Gardens, who wrote, under date of August 10, 1857: "Very few appendages to a garden of this kind are of more importance for instruction than a library and economic museum, and these gradually increase like a rolling snow-ball." This appears to have decided Mr. Shaw to provide a small library and museum; the building for which was erected in 1858–59. The selection of books was largely entrusted to Dr. Engelmann, in consultation with Hooker, Decaisne, Alexander Braun, and other of his botanical friends. At the same time Dr. Engelmann urged upon Mr. Shaw the purchase of the large herbarium of the then recently deceased Professor Bernhardi, of Erfurth, Germany, which was offered for sale at a very small price. Writing from Kew on this subject, August 11, 1857, Engelmann says: "You see that Hooker's active spirit is stirring up everything and everybody that comes in contact with him." And Hooker writes—January 1, 1858—"He (Engelmann) tells me of the herbarium of the late Dr. Bernhardi of Erfurth which he expects to buy for St. Louis. That ought to be a good commencement for the more scientific part of the establishment.

* * * The State ought to feel that it owes you much for so much public spirit, and so well directed."

Mr. Shaw has told Professor Trelease, the present Director of the Garden, that he had at one time planned a grand School of Botany, with residences for the faculty, laboratories, etc., opposite the main gate; but abandoned the project because of the wise advice of Dr. Asa Gray, who said that the experiment should be tried in a small way first; as such things cannot be forced, but must grow.

In the summer of 1866 Mr. Shaw was fortunate enough to secure the services of Mr. James Gurney, from the Royal Botanical Garden in Regent's Park, London, whose practical knowledge and experience, and faithful and conscientious devotion to his various duties, won the entire confidence of his employer, and contributed very largely to make Garden and Park what they now are. Mr. Shaw's personal supervision of both was, however, never abandoned; and in this congenial employment, and in perfecting arrangements for the continuance of the noble work he had so well begun, the last twenty-five years of his life were happily and appropriately spent. Until the summer of 1885 he had not been out of St. Louis for nearly twenty years, except for a drive to the neighboring village of Kirkwood to dine with a friend. During the heated term of the year mentioned, he became so much debilitated that his physician insisted upon a change of climate. He went to Northern Illinois and Wisconsin, spending some time at Lakeside on Pewaukee Lake, not far from Milwaukee. He returned greatly improved and resumed with renewed zeal his usual avocations. But he had passed far beyond the boundary line of three score and ten, and realized the truth of the old verse:

"For age will rust the brightest blade,
And time will break the stoutest bow;
Was never wight so starkly made
But time and age will lay him low."

On the 24th of July, 1889, he received numerous visitors to congratulate him upon the commencement of his ninetieth year. He was weak physically, though able to meet them in the drawing-room at Tower Grove, and his mind was

as clear as ever. This, however, was his last appearance in public. An attack of malaria upon an already enfeebled system speedily dissipated all hopes of recovery, and he died at 3:25 Sunday morning, August 25th. The death, peaceful and painless, occurred in his favorite room on the second floor of the old homestead; by the window of which he sat nearly every night for more than thirty years until the morning hours, absorbed in the reading which had been the delight of his life. This room was always plainly furnished, containing only a brass bedstead, tables, chairs, and the few books he loved to have near him. The windows look out upon the old garden which was the first botanical beginning at Tower Grove. On Saturday, August 31st, after such ceremonial as St. Louis never before bestowed upon any deceased citizen, Henry Shaw was laid to rest in the Mausoleum long prepared in the midst of the Garden he had created—not for himself merely, but for all the generations that shall come after him, and who, enjoying it, will "rise up and call him blessed." There, amid the trees, the grass, and the flowers which were so near and dear to him from infancy to old age; with the soft evening sky bending over him like a benediction, and the vesper song of birds mingling with the farewell hymn, he was left to sleep the sleep that knows no waking. And so the long and useful life was rounded to its close.

America was Mr. Shaw's country not merely by adoption, but by deliberate and well-considered choice—a choice he never regretted and of which he was always proud. When he retired from business he was in the prime of manhood, and with wealth amply sufficient in those days for the gratification of tastes far more luxurious than were his. It would have enabled him to live in England, or in any part of the Continent, much more easily and pleasantly, as a gentleman of leisure, than it was then possible to do in America. He had nothing except personal preference to keep him here, and very much, one would suppose, to induce him to take up permanent residence abroad. Yet after long and repeated absences—which, in most cases, would have ended in such residence—he returned to St. Louis to live and to die; to begin, carry forward, and consummate

the life-work with which his name will be forever associated.

Yet while Mr. Shaw was so thoroughly American in the true sense of the word, he was as thoroughly English in all those hereditary traits, ideas, and habits which are born in us and not made by us, and which inevitably take their shape and color from the soil and stock from which we spring. "Blood is thicker than water," and the English blood transmitted by a long line of unmixed English ancestry was always strong in him. He did not love England the less because he loved America more, and his attachment for the land of his birth remained deep and ardent—though undemonstrative—to the last. He liked to have about him things which reminded him of his old home. Much of the furniture in both his town and country house was of English manufacture of fifty years ago; most of the pictures and prints upon the walls were of English subjects, and he preferred to read his favorite authors in the English editions through which he first knew them. He was systematic in everything, as Englishmen of his generation were much more than they are now. Systematic in personal habits: eating, drinking, sleeping, exercise and recreation; to which regularity, guided always by prudence, his remarkable health to advanced age was largely due. Systematic above all in his business. Promptness and punctuality were cardinal virtues with him. He put off nothing until tomorrow that could as well be done today. Whatever he did himself was well done, and what he could not do himself he placed in competent hands, and whenever practicable gave it careful personal supervision. His penmanship was clear and remarkably handsome, and the books which contain the records of his public and private business would do honor to the best professional accountant. He made out the pay-rolls of both the Garden and Park up to the month of his death, and then allowed another to do it only because utterly unable himself to hold a pen. He managed business matters on strictly business principles, and in so doing knew no difference between a friend and a stranger. He would take no advantage, however legal, of either; but he expected both the friend and the stranger to be as faithful as he himself was

—and "his word" was ever "as good as his bond." He was a merchant of the old school, and his ideas of business honesty and honor belonged to the past rather than to the present; nor did he ever, under any circumstances, change them in practice to suit present conditions.

Mr. Shaw knew the value of money, as all men do who have labored for it as he did; but he did not, as many men do, love money for its own sake—for the power it gives or the luxuries it buys. He had none of that feverish greed of gold of which we see and feel so much. He retired from active business when in the very prime of life, content with what now looks like the quite moderate fortune of $250,000. There is every reason to believe that, with his exceptional qualifications for success in this department, he might easily have increased the $250,000 to $2,500,000 long before he had reached the age of sixty. He retired, not because he was afraid of losing what he had made, or thought he could not make any more; but because he felt he had enough, and intended to enjoy it. He always owned his money; his money never owned him. His tastes and habits were simple and sensible; he lived well, but not extravagantly, and with not the slightest attempt at ostentation. Up to the very last years of his life he drove himself the one-horse barouche which was his sole equipage, and not until friends warned him of the dangers incident to growing infirmity did he indulge in a carriage and coachman.

Mr. Shaw was not generous, in the ordinary acceptation of the word; that is, he did not respond to many of the innumerable appeals made to his benevolence, and had no hesitation in declining. In this, as in other things, he knew how to say "No"—and said it very often. He was not uncharitable, but the object of charity had to be unequivocally deserving to obtain assistance from him. He chose—and certainly had the right of choice—to be generous in the large rather than in the small. He reserved his contributions for the benefit of the many, instead of bestowing them upon the few; for the many not merely of his own day, but of all the days to come. From the moment he resolved to make this Garden and this Park for public uses forever, they became the central purpose and motive power

of his life. They were wife and children to him. For them he watched and worked, and to them and their present and future interests he consecrated all the energies of body and mind until he could watch and work no more. The Garden and the Park could not be what they are now, could not be what they surely will be hereafter, if the man who planned and perpetuated them had scattered his comparatively limited means among the multitude of applicants. He refused to be generous to some so that he might be more than generous to all.

The following anecdote may be related here: Some years ago Mr. Shaw was escorting a lady visitor through the Garden, and pointing out to her the various rare plants and flowers he knew so well and watched so fondly. She said to him: "I cannot understand, sir, how you are able to remember all these different and difficult names," "Madam," he replied with a courtly bow, "did you ever know a mother who could forget the names of her children? These plants and flowers are my children. How can I forget them?"

On a certain occasion when a bottle of choice Medoc was upon the table, Mr. Shaw—diluting his glass—remarked with a smile: "I learned to take my wine with a little water from Montaigne."

He was a great lover of the wise and witty old Gascon (from whose fountain so many writers have drawn their wit and wisdom without acknowledging the debt) and learned from him much more important things than the dilution of his wine. "He was, I think," says a close observer of him, "of the same bent of mind so far as life is concerned." Emerson, in his "Representative Men," takes Montaigne as a typical sceptic, not so much in religion—for, whatever may have been his private opinions, publicly he lived and died a Catholic—but in his general views of life. The device upon his seal was a pair of scales and the motto beneath, in old French: "What do I know?" Mr. Shaw might have adopted the same device and motto, for he certainly was governed in large measure by the principle they set forth. He took as little as possible upon trust, and as far as possible tested everything and everybody before giving his faith and confidence. He believed fully in men and things

only after they had been fully tried and found worthy. A gentleman who had long business association with him says: "It was more than two years after our first acquaintance before he was what is called 'social' with me, and five years before he invited me to his house. After that his confidence in me seemed to be established, and was never, so far as I know, withdrawn." But it is doubtful whether Mr. Shaw ever had, at any time, what is called "a bosom friend;" one to whom he could unreservedly reveal himself. He had not that need of sympathy and support which such intimacy usually implies. He was always self-supporting and self-poised, requiring no outside aid of any kind from any quarter. His friends were many, and he valued their friendship; but the nearest of them felt that they could come just so near, and no nearer—that there was a certain point they could not pass, even if so inclined; a place where he desired no companionship, where he stood alone.

Montaigne, if we may judge from the inimitable "Essays," looked at life from the philosophic standpoint, and rarely suffered his equanimity to be disturbed by any incident or accident, however annoying. In this enviable peculiarity Mr. Shaw followed his example. His naturally high temper was under such complete control that few ever suspected its existence. "In twenty-three years," says Mr. Gurney, the head gardener, "I never heard him speak a harsh or an irritable word. No matter what went wrong—and on such a place and with so many men things will go wrong occasionally—he was always pleasant and cheerful, making the best of what could not be helped." Illustrating this control of temper another informant says: "The only time, I think, I ever saw Mr. Shaw actually angry was when a certain person had failed to keep an important engagement and given a poor, if not provoking, excuse for his failure. Mr. Shaw relieved his mind to me on the subject, speaking very strongly and sharply for some minutes, while I sat watching the unusual exhibition with considerable curiosity. At last he caught my eye, stopped short and said: 'Ah, Mr. A———, I see by your face what you are thinking of. You are thinking that I have lost my tem-

per—and you are right. Let us go into the next room and take a glass of wine together. And will you be kind enough to ask Mr. C——— (the offending party) to dine with me next Sunday?' ''

Montaigne—as everybody who has read him knows—was the very prince of egotists, and had, so to speak, reduced egotism to a most delightful science. Mr. Shaw was no egotist, and, if he had a grain of egotism in his composition, concealed its presence perfectly. In conversation he was reticent rather than the reverse; talked little about himself, and less about what he had done or proposed doing for the public; manifested no anxiety for the appreciative praise he had so justly earned, and when it was given received it with modest dignity, and seldom made any reply beyond a bow and a word of thanks. In manners he was a fair reproduction of

"A fine old English gentleman,
One of the olden time"—

Only, perhaps, somewhat less effusive and more dignified than that traditional personage is represented to have been. He was always polite to all, and for ladies especially, had not merely scrupulous politeness, but that stately yet graceful courtesy which belonged to the ancient regime. And beneath it all there was a kind heart. To some one who inquired why he employed so many Bohemians, he replied: "The Bohemians do not seem to be very popular with us, and I think I ought to help them all I can." Walking one day in the Garden with a young lad who was visiting him, he met a lame workman engaged in sweeping up leaves, and greeted him with a "Good morning, Henry." A moment later, noticing that the boy had said nothing: "Charles, you did not speak to Henry. Go back and say 'Good morning' to him." Evidently the fine cynicism of Montaigne had never touched the heart of his admirer.

Mr. Shaw, though he had no knowledge of music, was very fond of it, and moreover, was a strong believer in its elevating and refining influence upon the popular mind. The Sunday afternoon concerts in the Park during the summer months are due to his love for and belief in music.

He was always present when health permitted, enjoying himself in seeing others enjoy what he had provided; and was especially pleased when a large audience gathered around the stand which he had adorned with marble busts of the great composers, to listen to their masterpieces. Perhaps the handsomest compliment ever offered him, and the one most highly appreciated, was the serenade at Tower Grove some two years ago by Gilmore's band, then giving their annual series of concerts at the Exposition. It was a lovely October day, with cloudless skies and mild yet invigorating air; the foliage just beginning to assume the many-colored livery of autumn, but still retaining the luxuriant growth of summer. Mr. Shaw was seated upon the lawn in front of the mansion, with a few friends about him, while at proper distance in front were grouped the sixty-five members of that famous orchestra. As the strains of soul-inspiring music saluted the ear of the venerable gentleman for whom they were primarily intended, his face lighted up with an expression of pleasure too deep for words, and he leaned forward in his chair as if unwilling to lose the faintest note of the divine harmony. The picture of which he was the central figure can never be forgotten by those who saw it; "once seen, became a part of sight."

From youth, until extreme age prevented, Mr. Shaw attended the theatre whenever the performance was of sufficient merit to attract him. He liked all good plays well played, but preferred comedy to tragedy; thinking there is enough real sorrow and suffering in the world without paying to see the unreal article upon the stage. He wanted, especially in his latter years, to be amused rather than deeply interested, and a hearty laugh was worth more to him than all the woes of "Hamlet" or "Lear." So it came to pass that of the four bronze bas-reliefs on the pedestal of the Shakespeare statue, the most conspicuous place is assigned to the one representing the late Ben DeBar in the character of "Falstaff." A friend, who was himself at that time the oldest living actor, good-naturedly remonstrated with him. "Why, Mr. Shaw," said he, "I knew DeBar well, and I liked him, too; he was a first-rate comedian in his line, but not a great dramatic artist by any means.

Yet you have honored him as Garrick or Siddons have never been honored, and he don't deserve it, sir!" "Probably you are quite right, Mr. L———, from a professional point of view," replied Mr. Shaw, with his usual smile, "but I am indebted to Mr. DeBar for a great many very pleasant hours, and am glad of the opportunity to partially repay that debt." It is to his recognition of a much higher order of dramatic ability that we owe the Neilson mulberry tree in the rear of the Shakespeare statue; marking the spot which "the incomparable Juliet" selected on her last visit to St. Louis for the slip from the poet's own mulberry at Stratford, which she would have sent had not untimely death forbidden. When this memorial tree was planted in October, 1880, Mr. Shaw and his old actor friend, Mr. L———, were both present, and threw in the first earth to fill the excavation.

But neither friends, nor books, nor music, nor drama, nor all combined, gave half the pleasure and satisfaction for the last twenty-five years of his life, which the Garden and Park furnished him. He lived *for* them, and as far as was practicable, *in* them; walking or driving every day, when weather and health allowed, and permitting no work of importance to go on without more or less of his personal inspection and direction. The late Dr. Asa Gray—than whom there can be no higher authority—once said: "This Park and the Botanical Garden are the finest institutions of the kind in the country; in variety of foliage the Park is unequaled."

Exactly when the idea of creating what is now Tower Grove Park first came to Mr. Shaw, is unknown; but it was doubtless suggested by what he had seen in Europe, and took active shape when the Garden was firmly established, and seemed to need some such supplementary accompaniment. The first steps were taken in 1866, but the enterprise did not assume definite form until the following year. Since then it has proceeded steadily and systematically, and, until his last illness, literally under the eye of the man who conceived this "thing of beauty" to be "a joy forever." More than 20,000 trees have been planted here; all raised in the arboretum of the Garden. Mr.

Shaw used to say when planting them that he did not expect to live to see these trees reach maturity; that he was "planting them for posterity." But nearly all of that splendid family which he had nursed and reared were fully grown when his coffin passed under their shadowing canopy of leaves to the Mausoleum in the Garden. The Park contains, including the surrounding strip, 276 and 7/100 acres; and nothing has been omitted, apparently, which could make the perfection of a pleasure ground. The walks, the drives, the ornamental water, the labyrinth, the shady groves, the well-kept grass and fragrant flowers, form a combination of attractions which no lover of Nature can resist. In the midst of these rare surroundings, like jewels in a worthy setting, are three statues of heroic size by Baron von Mueller, of Munich: Shakespeare, Humboldt, and Columbus. These noble bronzes are not merely works of art which any city in any country would be proud to possess, but they are curiously unique. Adelaide Neilson—whose judgment in such matters may be trusted— declared that "she had seen every memorial of Shakespeare of any consequence, public and private, in existence; and that this one was, in her opinion, decidedly the finest." The niece of Humboldt, after seeing this statue of her uncle at Munich, wrote Mr. Shaw, thanking him for the high honor conferred upon her family, and said Europe had done nothing comparable to it for the great naturalist. We know America has not; and we know, too, that neither Europe nor America has a monument to the discoverer of the New World at all comparable to the Columbus in Tower Grove Park. As has been well said: "If dumb metal could speak, the greatest of poets and the greatest of naturalists and the greatest of discoverers would salute each other across these verdant spaces and join in thanking the man who has bestowed upon them such generous and graceful immortality."

What the Missouri Botanical Garden is now, and promises to be hereafter, this volume will sufficiently tell. With Garden and Park present and prospective before us, and realizing as far as possible the contributions to human knowledge and human happiness which must flow from them in years to come, we may well say of Henry Shaw, what is

written of Sir Christopher Wren in the Cathedral of St. Paul's:

Si monumentum quaeris—circumspice.

NOTES

Dr. George T. Moore, Director of the Garden, gave an illustrated talk at the United States Veterans' Hospital, Jefferson Barracks, November 10, on "A Walk Through Shaw's Garden."

The Missouri Botanical Garden has acquired recently the private herbarium and botanical library of the late Rev. John Davis, of Hannibal, Missouri. The collection of plants consists of approximately 20,000 specimens representing principally the flora of Missouri, Illinois, and South Carolina.

Among the recent visitors to the Garden were Dr. F. J. Cryder, Director Boyce Thompson Southwestern Arboretum, Superior, Arizona; Dr. F. S. Harris, President of Brigham Young University, Provo, Utah; Mr. Ralph Griswold, who has recently completed his studies in Rome as a holder of a scholarship in landscape architecture; Mr. Smith, City Forester, and Mr. Lycan, City Florist, both of Oklahoma City.

STATISTICAL INFORMATION FOR OCTOBER, 1924

Garden Attendance:

Total number of visitors	23,180

Plant Accessions:

Total number of plants received in exchange	42
Total number of plants and seeds received as gifts	63

Library Accessions:

Total number of books and pamphlets bought	48
Total number of books and pamphlets donated	110

Herbarium Accessions:

By Gift—

Ashe, W. W.—*Pinus* sp. from Georgia	1
Ashe, W. W.—*Pinus* sp. from Florida	1
Beattie, S. H.—Plants of Arizona	6

Linder, D. H.—Fungi of Massachusetts	3
Neal, Dr. D. C.—Plants of Mississippi	3
Walpole, Prof. B. A.—Plants of Michigan	2
By Exchange—	
U. S. Department of Agriculture, by Professor A. S. Hitchcock—Grasses of Texas, New Mexico, and Arizona	76
U. S. Department of Agriculture, by Professor A. S. Hitchcock—Grasses of Brazil	55
By Purchase—	
Field Museum of Natural History—Plants of Bolivia	309
Werdermann, Dr. E.—Plants of Chile	300
By Field Work—	
Allen, Cyril—Plants of Colombia, South America	300
Total	1,056

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director

BENJAMIN M. DUGGAR
Physiologist in charge of Graduate Laboratory

EDGAR ANDERSON
Geneticist

HERMANN VON SCHRENK
Pathologist

LIONEL E. TISDALE
Research Assistant

JESSE M. GREENMAN
Curator of Herbarium

KATHERINE H. LEIGH
Secretary to the Director

EDWARD A. BURT
Mycologist and Librarian

NELL C. HORNER
Editor of Publications

G. H. PRING
Horticulturist

PAUL A. KOHL
Floriculturist

JOHN NOYES
Landscape Designer

EDGAR ANDERSON
In charge of School for Gardening

P. C. BRAWNER
Painter

J. LANGAN
Assistant Engineer

J. CUTAK
Exotics

C. MCGOVERN
Outside Floral Display

W. C. FAIRBANK
Plant Recorder

D. MILLER
Orchids

A. HUBER
Aquatics

G. NINTEMAN
Construction and Farms

J. H. KELLOGG
Herbaceous and Nursery

J. ULRICH
Inside Floral Display

W. F. LANGAN
Engineer

H. VALLENTINE
Carpenter

MISSOURI BOTANICAL GARDEN BULLETIN

Vol. XII DECEMBER, 1924 No. 10

CONTENTS

	Page
The Orchid Exhibition	127
Protecting Roses from Frost Injury	129
Smoke Injury to Roses	132
Test Garden	134
The First Recorded Account of the Use of Tobacco, and the Instrument Through Which It Was Inhaled	137
Notes	140
Statistical Information	142
Index to Illustrations of Volume XII	145
General Index to Volume XII	147

ST. LOUIS, MO.
1924

Published Monthly Except July and August by the Board of Trustees

SUBSCRIPTION PRICE:

ONE DOLLAR PER YEAR SINGLE COPIES TEN CENTS

BOARD OF TRUSTEES
OF THE MISSOURI BOTANICAL GARDEN

THE ORIGINAL MEMBERS WERE DESIGNATED IN MR. SHAW'S WILL AND THE BOARD SO CONSTITUTED, EXCLUSIVE OF THE *EX-OFFICIO* MEMBERS, IS SELF-PERPETUATING

President
EDWARDS WHITAKER.

Vice-President
DAVID S. H. SMITH.

SAMUEL C. DAVIS.
EDWARD C. ELIOT.
GEORGE C. HITCHCOCK.
THOMAS S. MAFFITT.
EDWARD MALLINCKRODT.
A. C. F. MEYER.
PHILIP C. SCANLAN.
JOHN F. SHEPLEY.

EX-OFFICIO MEMBERS

HERBERT S. HADLEY,
Chancellor of Washington University

FREDERICK F. JOHNSON,
Bishop of the Diocese of Missouri

HENRY W. KIEL,
Mayor of the City of St. Louis

GEORGE T. MOORE,
President of The Academy of Science of St. Louis

JOHN C. TOBIN,
President of the Board of Education of St. Louis

CHARLES A. ROE, Secretary.

GENERAL VIEW OF ORCHID DISPLAY.

Missouri Botanical Garden Bulletin

Vol. XII DECEMBER, 1924 No. 10

THE ORCHID EXHIBITION

The orchid exhibition was opened on Sunday, November 30, and despite the cold weather the response on the part of the public to it was very gratifying. Between the hours of one and five o'clock eight thousand people passed through the floral display house to view the debut of the Colombian orchids in St. Louis. This exhibition, resulting from the expedition into the Andes of Colombia, South America, during 1923, marks an epoch in the floral displays at the Garden.

During the latter part of October the outlook for the orchid exhibition was not very promising. The city at that time was enveloped in a dense smoke cloud which continued for the entire week, and the Garden greenhouses were likewise filled with the fumes. The effect upon the orchids was the loss of all buds which had penetrated their protective sheaths, and the open cattleya flowers soon succumbed, being unable to withstand the noxious atmosphere. The plants in the economic and citrus houses also showed the damaging effect, as they lost half of their leaves in much the same way that they are defoliated when an overdose of fumigant is applied by the novice. The only immediate remedy for overcoming this condition is the removal of the entire collection outside the smoke area. The smoke forced most of the florists out of the city many years ago, and the Garden is looking forward to the not-distant time when all of the growing houses may be located in the country. The cattleyas, not being subjected to such adverse atmospheric conditions in

their native home in the Andes, cannot be expected to adjust themselves to city life. Although the plants have been in this country for only twelve months, the deposit of soot upon the leaves is such as to enable one with a moist finger to write upon the upper surface of the leaves.

The flowering orchids are staged in the floral display house in both a natural and artificial arrangement. The natural arrangement suggests their epiphytic habit as seen growing upon trees in the tropics. Most of the plants, however, are placed upon tiers of stages for mass effect. The original arrangement of the show included a double stage through the middle of the house, with two four-foot walks on each side, but this left too little space for the accommodation of the Sunday crowds. By 2:30 o'clock on the opening Sunday the house was filled to capacity, and an hour later the line of visitors extended back to the palm house, necessitating their waiting at least fifteen minutes in the cold before viewing the show. Consequently, the exhibit was entirely rearranged the following day, the middle staging being removed and the plants banked on the north, east, and west sides, the center of the house being left free for the accommodation of large crowds.

Of the five thousand plants imported from Colombia over one thousand were in bloom for the opening Sunday. Most of the remaining plants are in bud in the growing houses awaiting their removal to the floral display house when in full bloom. Because of the large number of plants in reserve it will be possible to prolong the show until February. Of the cattleyas the two main varieties shown are the Tulipan (*Cattleya Trianae*), which flowers first, and the Flora de Mayo (*Cattleya Schroederae*). In collecting these varieties the hoped-for prize is a pure white variety. There is no way of distinguishing this variety except by the flowers, and since most of the plants were collected when void of flowers the finding of an albino is purely a matter of chance. It was consequently very gratifying to find two plants bearing albino flowers in the first thousand to bloom. Among the typical mauve-colored flowers there is the greatest variation, ranging from the lightest *pallida* to the darkest purple forms.

BANK OF ORCHIDS IN FLORAL DISPLAY HOUSE.

WHITE TULIPAN (CATTLEYA TRIANAE VAR. ALBA)

The hybrids recently imported from England are likewise coming into bloom. The large-flowered *Brasso-Cattleya* "Penelope" has three flowers, each measuring eight inches across. It is easily recognized by its extraordinary large fringed lip. An unusual color combination of yellow petals and purple lip is presented by the *Laelio-Cattleya luminosa* var. *aurea* now in bloom. Mimicry is well shown by the butterfly orchid (*Oncidium Papilio* and *P. Kramerianum*) from the West Indies and Brazil, a group of which is displayed upon a tree stump. A large number of the lady's slipper orchids are also shown in variety. These are not as popular as the more highly-colored cattleyas, being regarded by the layman more as a curiosity. However, to the connoisseur their variety and form are intensely interesting. The late D. S. Brown made these plants his specialty, bringing together the best varieties from all parts of the world. His entire collection was presented to the Garden in 1919.

A series of hand-colored photographs which were taken during the Colombian expedition are displayed, depicting the orchid as it grows in its native habitat, the difficulties of transporting them by mule back, raft, etc., and their final arrival at the Garden.

PROTECTING ROSES FROM FROST INJURY

Inquiries are being received at the Garden again this year about protecting roses for the winter. We sometimes think that the Middle-West suffers more from extremes in temperature than other parts of the country. To a certain extent it does, but if we follow the temperature readings from year to year we are impressed with the fact that the sudden changes from mild to cold and the reverse are usually quite general. Further north there is more snow, which is a good protection if it precedes a cold wave, but that natural protection is frequently missing in this region. Some of our winters are so mild that protecting material is a detriment rather than a help to the plants. So, from year to year, we must be governed by existing conditions.

When and how shall I cover my roses? are the questions most frequently received by mail and telephone. We would be fortunate if we could definitely state the date to protect the roses. Some seasons all our coldest weather comes before Christmas, and other years the lawns are green until after the New Year and then the cold snaps come. It is evident that adequate protection for the coldest weather, in the early part of the winter, is sometimes too heavy during mild, wet spells coming later. During such periods the plants may start prematurely and damage results from the stems rotting. In normal years the roses should have some protection by Thanksgiving time. The best plan to follow is in the fall to mound some soil around the base of the plants and later, when colder weather approaches, to add some other protecting material. Those having only a few plants may apply this heavier covering when the colder weather is predicted, but those with many plants must protect them earlier, before a change to colder weather takes them unawares. In normal years roses do not suffer much from temperature changes until after the New Year. From January to April is the critical time for roses.

Before mentioning the various materials that may be used for protecting roses, it might be well to again emphasize the fact that the word "protection" does not mean that all frost is excluded but simply that too rapid change from one extreme in temperature to another is prevented and the plant shielded from the wind and the sun. The impression is firmly fixed in the minds of many that in protecting roses all cold must be excluded, with the result that the roses are smothered with too much covering.

Plate 38 illustrates methods of protecting roses. The hybrid teas have bundles of ornamental grass leaves tied around them and then the soil drawn around the base to steady the "straw men" and further protect the base of the plants. In some cases stakes are necessary to prevent the bundles of straw from blowing over. Another bed of dwarf roses has been entirely covered with coarse material, which may be the stems of goldenrod, hardy asters, or any material of like nature. Such "roughage" forms a protecting cover that

BRASSO-CATTLEYA "PENELOPE".

PORTION OF ROSE GARDEN, SHOWING WINTER PROTECTION.

SHOWING METHOD OF PROTECTING CLIMBING ROSES.

will not pack with repeated rains and snows, permits air to circulate around the plants and still breaks the force of severe drying winds, and that prevents the rays of the sun from striking the rose stems. Before applying such a covering of loose material, the soil may be mounded around the base of the plants. There is some objection, but not a serious one, to using such material on account of the seeds it contains. The lower figure of plate 38 shows a method of protecting climbing roses against a south wall. In this case straw mats were used, but other materials, such as sacks, burlap, long grasses or corn fodder, are possible. Climbing roses against a south wall are subject to more injury than climbers in the open.

Barrels and boxes are sometimes inverted over rose plants and a few dry leaves thrown around them. It is better to leave the containers open on the north side to permit free air circulation. Dry leaves are ideal for protecting roses if a waterproof covering is placed over them. Exposed beds, with leaves for covering, become soggy towards spring and much damage may result from rot. Strawy manure placed around rose bushes will also act as a sponge if left exposed. Straw and the other coarse materials mentioned are to be preferred.

The hybrid perpetual or June roses, and the polyantha or baby rambler roses need no protection. However, a little coarse material thrown over the plants will do no harm and prevents the loss of any in severe winters. Most of the climbing roses survive our normal winters without any protection, but if protection is desired, the plants should be shielded, particularly on the south side, to prevent the sun from reaching the stems.

In the late winter, some time in February or March, we usually have a few mild days. Most people at such a time itch to work in the garden and one of the first rash things they do is to pull off all the protecting coverings. This would not be a serious act if the material were replaced when the weather again grows cold, but usually this is not done and thereby the method of successfully carrying the plants through the winter is defeated. It is better to let the cov-

erings remain, even though growth is starting, until the danger of heavy freezing is over. Winter usually makes one concerted effort to remain, in the latter part of March or the beginning of April, and it is this spell that must be guarded against. It is advisable to remove the coverings gradually, so that if unseasonable weather comes the plants will not be entirely unprotected.

SMOKE INJURY TO ROSES

Roses can be protected against frost damage by some kind of covering, but there is no known protection against smoke injury. All plant life suffers in a smoky atmosphere, some plants being more susceptible than others. Roses suffer from the periods of smoky atmosphere, but it is difficult to describe the injury. While the damage is not immediately noticeable, the vitality of the plants is gradually lowered. Certain roses simply will not grow. They may remain alive for a few years without making much growth and then finally succumb. Examples of this are the Persian and Harrison's yellow roses planted in the Garden a few years ago, which threw up a number of shoots the first season, blossomed the second season, but made no new growth and then died during the third year. In the county these grow readily. The much-heralded Hugonis rose remains at a standstill from year to year. Plants six years old have grown about four feet and new canes attain about the same height. A few flowers appear every spring, but never do the plants bloom as profusely as the nurserymen and growers claim for Hugonis in other places. Wonderful examples of this plant have been seen elsewhere, but from the experiences up to this time it cannot be recommended for smoky localities.

The baby rambler roses are not growing as well as a few years ago, but are still among our best. The rugosa roses grow vigorously from year to year and apparently the smoke has little effect on them. Most of the hybrid perpetuals still are doing splendidly, although Captain Christy has not been thriving. The sweetbrier roses grow rampantly, are extremely hardy and require much room to spread, but unfor-

tunately, with all these qualities to recommend them, their blooming season is quite short. There are always some hybrid tea roses that do better than others and whether this is due to the variety or whether the smoke is also responsible is not easily determined. It is a fact that the more robust roses in this class, that have been recommended from time to time, are the ones that withstand the smoky atmosphere fairly successfully; just to mention a few—Etoile de France, Florence Pemberton, Gruss an Teplitz, La Tosca, Lady Ursula, Mme. Jules Bouche, Mrs. Arthur Robert Waddell, and Radiance. Most of the climbers are successfully grown in a smoky place.

The Garden is situated near one of the industrial districts and the railroads and is surrounded by homes and apartments where much smoke is constantly pouring out of the stacks, so that the task of maintaining a collection of varieties in the rose garden is a difficult one. To those contemplating planting roses where smoky conditions prevail, it is suggested they use some hybrid perpetuals, rugosas, polyanthas, climbers and the strongest of the hybrid teas. The following is a list of roses to select from:

HYBRID TEAS

Etoile de France
Florence Pemberton
Francis Scott Key
Gruss an Teplitz
La Tosca
Lady Ursula
Mme. Jules Bouche
Mrs. Arthur Robert Waddell
Radiance
Souv. du President Carnot

HYBRID PERPETUALS

Baroness Rothschild
Captain Hayward
Clio
Frau Karl Druschki
General Jacqueminot
George Arends
Mrs. John Laing
Mrs. R. G. Sharmon-Crawford
Paul Neyron
Prince Camille de Rohan

CLIMBERS

Aviateur Bleriot
Christine Wright
Dorothy Perkins
Dr. W. Van Fleet
Excelsa
Gardenia
Lady Gay
Paul's Scarlet Climber
Silver Moon
Tausendschön

RUGOSAS

Conrad Ferdinand Meyer
F. J. Grootendorst
Nova Zembla
Rugosa alba
Rugosa rubroplena

POLYANTHAS

Katarina Zeimet
Clotilde Soupert
Marie Pavic
Miss Edith Cavell
Orleans

TEST GARDEN

This year, as in the past seasons, the policy of the Garden has been to test the various new plants listed by the seed firms. Many of these so-called novelties are listed for a number of years, but occasionally some worth-while plant is found.

Among our commonest autumn wildflowers are the hardy asters. They have small, yellow-centered, daisy-like flowers borne in long, loosely panicled sprays. There are about two or three hundred species of the genus Aster, just how many it is difficult to say, for they vary enormously and it is hard to decide where one species leaves off and another begins. They are so common in this country as to have escaped the notice of our American gardeners, but when several of our species were introduced into England their possibilities as a garden flower were soon recognized. They have now been grown in English gardens for over a generation under the name of "Michaelmas daisies," and the same variation which defies the botanist has resulted in many new garden forms.

One of the features of the 1924 test garden was a collection of over one hundred varieties of these repatriated Americans. From mid-August until well into October they provided a succession of bloom and were a bright spot of color in the garden. The later varieties were particularly effective, as they had for a background the bright gold of a near-by clump of autumn sunflowers (*Helianthus angustifolius*). It is naturally difficult to classify the Michaelmas daisies, as they are even more variable than the wild species from which they were derived. The following are among the more outstanding groups:

Aster novae-angliae.—Tall plants 3-6 feet high; stem stout and usually not branching below; flowers large, rays 40-60, pink or purple; the entire plant very hairy. "Mrs. Raynor," a good tall-growing pink, is illustrated in plate 39.

Aster cordifolius.—Leaves heart-shaped; plant of medium height, much-branched; flowers very numerous, small, light blue, exceptionally good for cutting. "Ideal," a typical *cordifolius*, is illustrated in fig. 4 of pl. 39.

FOUR DISTINCT TYPES OF MICHAELMAS DAISIES.

Precioza (Amellus).
Mrs. Raynor (novae-angliae).
Mrs. S. T. Wright (novi-belgii).
Ideal (cordifolius).

COLLECTION OF STRAW FLOWERS

Aster Amellus.—Derived from a European species; plants of low to medium height; flowers very large, sometimes 2 inches across, relatively few in number. "Precioza" and "King George" are standard varieties.

Aster novi-belgii.—To this variable species are referred by far the largest number of garden forms. Plants of medium height; flowers numerous, of small to medium size, in various soft shades of blue, lavender, and pink. "Mrs. S. T. Wright," "Daydream," "Brussels," and "Rapture" illustrate the wide variation within the group. Many of the varieties double or semi-double.

A bed of hardy chrysanthemums was very effective this fall, fourteen varieties having been sent in for trial by the Garden Club of America. Two geums have been grown and will bloom next year and also a bed of the new foxglove "The Shirley," listed by the Garden Club of America as one of the "irresistibles." The various celosias were again grown and with them the widely advertised "Celosiamum." Huge heads of this celosia in old rose, yellow, and red, as well as the *cristata* and plumed types, were in the collection. The "Mayflower" verbena is a good addition to the verbenas, as it is a very beautiful large-flowered, pink variety. Gaillardia "The Dazzler" threw a few flowers the first year from seed, but these blooms were little different from the average gaillardias. Antirrhinum "Indian Summer" had very large flowers of a pleasing color and was a good bloomer. Two varieties of the flowering tobacco, "Sutton's Miniature White" and "Crimson King," grew to a height of two feet and bloomed from late spring until frost. *Viola lutea splendens* and *Viola Papilio* had very attractive pansy-like flowers that bloomed the entire season.

In addition to the plants mentioned there were also grown various oriental poppies from seed, *Helianthus angustifolius,* aquilegias, annual senecios, blue petunias, *Linum hirsutum, Helianthus cucumerifolius,* and coleus.

A part of the test garden was also given over to straw flowers. These and other dried plants for fall and winter decoration have been gaining in popularity the last two years, due partly to various gardening papers having featured them.

That the public might have the opportunity of seeing these plants growing, a collection of the more common kinds was included in the test garden during the past summer. In connection with the dahlia show in October, two tables of dried bouquets were staged so that ideas might be gained as to how these various flowers and plants could be combined.

Plate 40 shows five of the vases exhibited. Vase I contains helichrysum, the flowers called strawflowers, some annual statice and a filler of the perennial statice, *Statice latifolia.* There is no material more suitable for combining with other straw flowers than *Statice latifolia,* as it gives a graceful touch to the otherwise stiff strawflowers. Vase II contains the white snowberry and the red Japanese barberry, the contrast in color being very striking. Unfortunately, the snowberry shrivels and turns brown after a few weeks, while the barberry can be kept much longer. Vase III has a combination of the globe-amaranth and *Statice latifolia,* the two combining beautifully in color and shape. Vase IV holds a bunch of false bittersweet, *Celastrus scandens.* Bittersweet, as it is commonly called, may be gathered before or after the leaves fall. A small vase of this vine in a room is very effective. It is urged, however, that it not be gathered in too large quantities, since it is becoming scarce around the larger cities along the main country roads. Vase V contains a few stalks of the Chinese lantern-plant, *Physalis Francheti.* These balloon-like fruits are very effective when used alone or combined with bittersweet, the colors of the two being almost alike,

Other strawflowers grown in the test garden included honesty (*Lunaria annua*), *Xeranthemum annuum, Acroclinium roseum,* tassel-flower (*Cacalia coccinea*), *Statice spicata, Statice Suworowii, Statice sinuatum,* and *Ammobium alatum.* As *Statice latifolia* is perennial and very hardy, it is much to be preferred to the various annual statices for bouquet work.

Many ornamental grasses lend themselves admirably for larger receptacles. The spike grass, *Uniola latifolia,* is quite effective, with its flat, drooping spikelets. Sprigs of the cot-

ton plant, with the open bolls and leaves attached, are very pretty when placed against a dark wall.

Brilliantly-colored leaves of the oak, sassafras, maple, etc., are good materials for autumn decoration. The branches should be gathered about the middle of October when the leaves are fully colored. After gathering, they should be pressed lightly between newspapers for a day, then laid flat, and bits of paraffin or wax placed on each leaf and spread with a moderately warm iron. This coating of wax prevents the leaves from curling in the dry atmosphere and keeps them in the same condition as when gathered.

All of the strawflowers should be gathered in the summer just before the blossoms are fully open, tied in small bundles, and hung away to dry. During this drying process the flower heads should hang down in order to keep the necks straight. The flower stalks are very brittle and break readily, but if wired they may be bent into any position and worked into more graceful bouquets.

The lotus leaves and pods are also being sought for fall decoration. The present custom of dyeing lotus leaves and grasses with brilliant colors and bronzes spoils the beautiful autumn colors of nature, and no material is as effective and beautiful as when left in its natural color.

There are many berried plants that can be used in the fall for decoration, but they are not as lasting as the dried materials.

THE FIRST RECORDED ACCOUNT OF THE USE OF TOBACCO, AND THE INSTRUMENT THROUGH WHICH IT WAS INHALED

Among the valuable and interesting books in the Missouri Botanical Garden library is a very rare first edition of "*La Historia General de las Indias*" by El Capitan Gonzolo Fernandez de Oviedo y Baldés. This book was printed in Seville in 1535 and is of special interest because it contains the first mention of tobacco as well as a figure of the primitive implement, the predecessor of the modern pipe, used by the native

Indians in inhaling smoke. It is evident from the account given by Oviedo that the word "tobacco" is derived from the instrument or pipe used in smoking and not the plant. While this derivation is suggested in the dictionaries, the book referred to is an earlier authority for this origin than any usually cited.

The author traveled extensively in America, and the work was written from official documents sent to him as the authorized chronicler of the Indies. The title-page bears the imperial arms surrounded by a handsome border, and there are many initials and curious woodcuts representing the aborigines as well as animals and plants of America. It is the earliest natural history of America and one of the rarest and most important books on the New World. It was the first general review of the new American empire of Spain, discussing the almost unlimited grandeur opened up by the passage through Magellan's Straits and the discoveries of Mexico and the Pacific. The policy which should be adopted by the monarchy is fully outlined and the book was probably suppressed in Spain for "prudential reasons." This would account for its great rarity. The *carta missiva* which occupies two leaves at the end of this volume, and was printed at the same time, bears an autographed signature of the author in this form:

"R^{mo} & ill^{mo} Sen^{or}
las manos de v. s. Besa
Go. Fernandz."

Below is a rather free translation of that part of the book relating to tobacco and its use:

"About the tabacos or smoking material used by the Indians of that Spanish Island."

"The Indians on that island have among other usages a very bad one which is to use for smoking an article called by them *tabaco* in order that they may lose consciousness. They make the smoke from a certain plant which, as far as I could determine, belongs to a kind of hog's-bean, but not of the same form and size, to judge from appearances, because this plant has a stem or bud about four or five palms in length or

TITLE-PAGE OF "LA HISTORIA GENERAL DE LAS INDIAS" BY EL CAPITAN GONZOLO FERNANDEZ DE OVIEDO Y BALDES.

Quinto Fo. clvij.

bores muy grãdes:y ẽ otras menores ꝙ hue
cos y ẽcorados cõ vn cuero ó cieruo/o ó otro
animal:pero como en estas yslas no auia a-
nimales para los encorar/vsauan los atam
bores que he dicho/y dellos misinos ꝙ de-
los otros se vsan oy en la tierra firme/como
se dira en la parte que conuenga.

Capitu.ij.de los taba-

cos o ahumadas que los indios acostũbrã
en esta ysla espaniola:ꝙ la manera de las ca-
mas en que duermen.

Saban los indios desta isla en
tre otros sus vicios vno muy
malo/que es tomar vnas ahu-
madas que ellos llamã tabaco
para salir de sentido:y esto ha-
zian con el humo de cierta yerua/q̃ alo q̃ yo
he podido entender es de calidad del vele-
ño:pero no de aquella hechura o forma ala
vista:porque esta yerua es vn tallo como q̃-
tro o cinco palmos/poco mas o menos ó al
to/y con vnas hojas ánchas ꝙ gruessas ꝙ blã
das ꝙ vellosas:y el verdor tira algo ala co-
lor de las hojas de la lengua de buey/o Bu-
glosa:que llaman los erbolarios ꝙ medicos
Esta yerua que digo en el genero es muy se
mejante al Veleño. La qual toman de a-
questa manera. Los Caciques ꝙ hombres
principales tenian vnos pali-
llos huecos: del tamaño de
vn reme o menos / de la gros-
seza del dedo menor de la ma-
no. Y estos cañutos tenian
dos cañones respondiẽtes a
vno/como aqui esta pintado
ꝙ todo en vna pieça. Y los
dos ponian en las ventanas de las narizes/
y el otro en el humo ꝙ yerua que ardia. Y
estauan muy lisos ꝙ bien labrados: ꝙ que-
mauan las hojas de aquella yerua arrebu-
jadas o embueltas de la manera que los pa
jes cortesanos suelen echar se ahumadas: ꝙ
ponian la otra parte del cañuto senzillo en
la yerua que ardia:ꝙ tomauan el aliento ꝙ
humo para si vna ꝙ dos ꝙ tres/ꝙ mas vezes
quanto lo podian sofrir/hasta que que-
dauan sin sentido grande espacio tendidos
en tierra beodos o adormidos de vn gra-
ue ꝙ muy pesado sueño. E los Indios que
no alcançauan aquellos palillos/ tomauan
aquel humo con vnos Calamos o Cañ e
las de carrizos. E aquel tal instrumento cõ
que tomã el humo/o alas Cañuelas que es
dicho/llaman los Indios Tabaco:ꝙ no a-
la yerua o sueño que les toma(como pensa-
uan algunos.)Esta yerua tenian los Indi
os por cosa muy preciada / y la criauan en
sus huertos ꝙ labranças para el efecto que
es dicho/dando se a entender / que este to-
mar de aquella yerua ꝙ sahumerio/ no tan
solo les era sana:pero muy sancta cosa. Y
assi como cae el Cacique o principal en tier
ra/tomanle sus mugeres(que son muchas)
y echan le en su cama/si el antes se lo ha mã
dado. ¶Pero si no lo dixo ꝙ prouey o primero/no quiere sino que lo dexẽ assi/hasta que
se le passe el vino ꝙ aquel adormescimiento.
Y o no puedo pensar que plazer se saca ó tal
acto/sino es la gula de beuer hasta dar de es
paldas:pero se que ya algunos christianos
lo vsauan:en especial los que estauan toca-
dos del mal de las Buas:porque dizen los
tales que en aquel tiempo que estan assi tras
portados/no sienten los dolores de su enfer
medad. Y no me parece ques esso otra cosa/
sino estar muerto en vida el que tal haze: lo
qual tengo por peor que el dolor de que se
escusan/pues no sanan por esso. Al presen-
te muchos Negros de los que estan en esta
ciudad y en la ysla toda han tomado la mis-
ma costumbre:ꝙ crian en las haziendas y e-
redamientos de sus amos esta yerua para
lo que es dicho. y ellos toman las mesmas
ahumadas/porque dizen que quando pa-
ran del trabajo ꝙ hazen estos Tabacos les
quitan el cansancio. Aqui me parece que
quadra vna costumbre viciosa ꝙ mala que
la gente de Tracia vsa entre otros sus vici-
os/segun el Albulensis escrue libro tercero
capitulo ciento y sessenta y ocho sobre Eu-
sebio ó los tpos. Dónde dize q̃ tiene por costũ
bre todos/ varões ꝙ mugeres ó comer alrre

REPRODUCTION OF PAGE OF "LA HISTORIA GENERAL DE LAS INDIAS", WHICH CONTAINS FIRST MENTION OF TOBACCO, AND FIGURE OF PRIMITIVE PIPE.

less, with very large soft and cottony leaves and the green color is inclining to that of the ox-tongue or bugloss (as it is called by the herbalists and physicians). The plant produces in some kinds sex seeds like the hog's-bean which they use in the following way: The *caciques* or the chieftains possess some hollow bobbins of the size of *xeme*[1] and less than the little finger of the hand in thickness. These tubes have two tubes converging in one as it is drawn (Table 1a, Fig. 7a) and all of a piece. They put the two tubes in the nostrils and the other in the plant which is burning or parched with heat. The plants were planted on smooth fields and very well cultivated. They use to smoke the leaves crumpled or involuted like the leaves used to drive away odors. They take the smoke not only once but twice or three times or as often as they can endure, as long as they are no longer unconscious, or knocked over intoxicated or seized with a heavy and very deep sleep. The Indians who do not use the hollow bobbins used to take the smoke by some kind of tubes or *carrizos*[2], and it is after this instrument used for taking the smoke, or after these tubes that the Indians call them *tabaco*, never after the plant or the sleep with which they are seized (as some persons did believe). The Indians esteem this plant as a thing of great value and they grow them in their gardens and on their farms for that purpose I make mention. It will help to the understanding of the reason for taking that plant for smoking since it is not only a good thing but a very holy one for them. And as soon as the *cacique* or chieftain falls on the ground he is taken by his wives (who are many) and put to his bed or hammock, if he had ordered it before he fell down; but if he did not say and order it at first they do not touch him, but let him lie on the ground as long as he is left in that unconsciousness or sleep. I cannot understand what the enjoyment this brings at the beginning if it is not the mania for drinking which seizes the first who takes the smoke. Some drink so much of the wine they possess that they are drunk before they begin to smoke, but as soon as they feel to have

---

[1] *Xeme*, the distance from the end of the thumb to the end of the forefinger, both extended.

[2] Common reed grass, *Arundo phragmites*.

had quite enough and feel full, they hasten to smoke. And also many people who do not drink excessively used to smoke *tabaco* as long as they lie on the back or until they tumble down, but without indisposition, only like sleeping men. It is possible that also some Christians use it already especially those who do suffer from *mal de las buas*, because they say that during the time of being out of their senses they do not feel the smarting pains of their illness and I do not know.

"At present many negroes living in that town and throughout the whole island have embraced the same custom and they cultivate on the farms and estates of their masters the plant I spoke about. They use the articles for smoking or *tabacos* because they say that they fatigue if they cannot work and smoke the *tabaco*.

"I happen to remember some of the vicious and bad customs of the people of Tracia, according to Abulensis super Eusebio *De los tiempos* (Abulensis, lib. III, cap. 168) where he says that among other reproachful faults, all, men and women, used to dine round a fire and breathe much in order to become intoxicated or it may be the following: if they have not wine they take seeds of some plants, growing in that country, which thrown into the fire, produce an odor which intoxicates all those present without drinking, and it seems to me to be the same as the *tabacos* used by the Indians."

NOTES

Mr. G. H. Pring, Horticulturist to the Garden, attended the National Flower Show Committee meeting at Kansas City, December 4.

Dr. B. M. Duggar, Physiologist to the Garden, spoke before the St. Louis Garden Club, November 18, on "The Effects of Length of Day on Flowering of Plants."

The Garden was awarded a certificate of merit by the St. Louis Flower Show Association at the annual flower show at the Coliseum, November 11-12, for its collection of orchids.

Mr. Pring gave his illustrated lecture "Collecting Orchids in Colombia, South America" before the Parent-Teachers' Association of the Adams School, December 10.

MO. BOT. GARD. BULL., VOL. 12, 1924.

no fuere en quales los han menester: y tanto es mayor el peligro q̃nto el camino es mas luengo y. V. S. reuerendissima tan apartado delo ver: y tanta dubda como ocurre en saberse aca la verdad. Y por esto querria yo mõseñor reuerẽdissimo q̃. V. S. ꝑmero q̃ estos pastores y oficiales aculla passassen fuesse de vista informado de sus personas y calidades: porque no ouiesse necessidad de llamar los despues para su castigo: y la conciẽcia real de Cesar y la de. V. S. reuerẽdissima y dessos señores del cõsejo mas sin escrupulo estuuiessen: y los vezinos de aq̃llas partes mas seguros y pacificamẽte biuiessemos a gloria y alabãça de jesu christo: el qual la reuerendissima y illustrissima persona y estado de. V. S. largos tiempos prospere a su santo seruicio. De seuilla a treynta dias del mes de Setiembre: de. MD. xx. y treynta y cinco años.

R^mo & Il^mo Señor

las manos de. V. S.

Bes

Ofernandez

CARTA MISSIVA OF "LA HISTORIA GENERAL DE LAS INDIAS," BEARING AUTHOR'S AUTOGRAPH.

The November, 1924, number of the Bulletin of the Garden Club of America contains an article by Dr. George T. Moore, Director of the Garden, entitled "The Feeding of Plants."

Mr. G. H. Pring acted as judge of the Flower Show of the Kansas State Florists' Association, Wichita, Kansas, October 29-31; and was superintendent of the St. Louis Flower Show at the Coliseum, November 11-12.

At the botanists' dinner during the meetings of the American Association for the Advancement of Science, Washington, D. C., December 30, Dr. B. M. Duggar, Physiologist to the Garden, will read the address as retiring president of the Botanical Society of America. The title of his address is "Physiology in the Service of Pathology."

Among those visiting the Garden recently were Prof. Shunsuke Kusano, professor of botany, Imperial University of Tokyo, Tokyo, Japan; Dr. J. B. S. Norton, professor of botany, Maryland Agricultural College, College Park, Maryland; Prof. E. L. Moseley, head of the department of science, State Teachers' College, Bowling Green, Ohio; Dr. D. T. MacDougal, Director Botanical Research of the Desert Laboratory (Tucson, Ariz.) of the Carnegie Institution of Washington.

The following unclaimed articles, found in the Garden during the summer and fall, may be obtained by applying at 2315 Tower Grove Avenue:

3 pairs spectacles
2 beaded bags
1 velvet bag
1 raincoat belt
1 baby's bib
1 pair gloves
2 rings
1 Knights of Columbus emblem
1 umbrella

STATISTICAL INFORMATION FOR NOVEMBER, 1924

GARDEN ATTENDANCE:

Total number of visitors..... 58,279

PLANT ACCESSIONS:

Total number of plants received in exchange..... 150
Total number of seed packets received as gifts..... 6

PLANT DISTRIBUTION:

Total number of plants distributed in exchange..... 314

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought 30
Total number of books and pamphlets donated 198

HERBARIUM ACCESSIONS:

By Gift—

Bartholomew, E.—Fungi from various localities..... 6
Carpenter, Mrs. G. O.—*Pinus quadrifolia* Parlatore from Utah 1
Fairman, Dr. C. E.—Fungi of New York..... 2
Florists' Publishing Company—*Chenopodium capitatum* (L.) Asch. from Washington..... 1
Posse, Miss Christine—Microscope slides of plant materials 20
Schrenk, Dr. H. von—Cone of *Pinus tropicalis* Morelet from Isle of Pines, Cuba..... 1
Twardock, J. A.—*Berberis canadensis* Mill. from Illinois 1

By Purchase—

Broadway, W. E.—Plants of Trinidad, British West Indies, Century IV..... 100
Canton Christian College—Plants of China..... 260
Davis Estate, The John W.—The private herbarium of the late Rev. John W. Davis, estimated at..... 20,000
Fisher, George L.—Plants of Mexico..... 149
Henderson, Professor L. F.—Plants of Hood River County, Oregon 396
Mille, S. J. Louis—Plants of Ecuador 226
Payson, Dr. E. B.—Plants of Wyoming collected by E. B. Payson and G. M. Armstrong..... 578
Weigel, Theodor Oswald—Hayek's *Centaureae exsiccatae criticae*, Fasc. IV, Nos. 141-164, inclusive.... 24

By Exchange—

California Academy of Science, by Miss Alice Eastwood —Plants of Lower California..... 174
California Academy of Science—Miscellaneous duplicates, chiefly from California..... 50
Dudley Herbarium, Stanford University—Plants of western United States..... 380

University of Wisconsin, by Dr. J. J. Davis—Fungi *Wisconenses exsiccati.* Decades XII-XIII Nos 111-130, inclusive 20

By Field Work—

Allen, Cyril—Plants of Colombia, S. A..... 150

Total 22,539

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

Index to Illustrations

Page

View through mausoleum gate towards old residence..... 1
Bur oak, large specimen of, at East Prairie, Missouri..... 25
White-oak acorns used in making meal..... 32
Muffins made from acorn meal..... 32
Pruning the California privet at the Garden..... 37
Prunus Mahaleb, showing bark damaged by rabbits..... 40
Eremurus at the Garden 41
House wren, novel nesting place of a..... 45
Black Hamburg grape..... 46
Foster's Seedling 47
Trichopilia suavis 52
Trichopilia suavis var. *alba*..... 53
Nectarine "Stanwick" 57
Nectarine "Early Rivers"..... 58
Maidenhair tree in fruit at the Garden..... 64
Map of St. Louis, showing zones with reference to vegetation... 69
Plans of Arsenal Street and Humphrey Street gardens..... 80
Plans of Utah and Westminster Place gardens..... 81
An Arsenal Street garden..... 82
Japanese garden on Washington Boulevard..... 82
Back-yard garden on Utah Place..... 83
Back-yard garden on Westminster Place..... 83
Tower Grove Station garden..... 84
Iris beds across the tracks from Tower Grove Station..... 84
Showing damage to trees at the Garden caused by wind storm of July 17..... 87
Maple tree in front of mausoleum, showing limbs and branches blown off by storm of July 17..... 88
Poison-ivy growing in association with Virginia creeper..... 89
Poison-ivy, spray of, at left, Virginia creeper at right..... 90
Trichopilia coccinea 91
Orchids, shipment of, from England, showing method of packing 92
Laburnum anagyroides 93
Obverse and reverse of medal awarded to the Garden at the first annual show of the American Orchid Society in Boston, May 8-11, for hand-colored photographs illustrating orchid collecting 94
Silver cup awarded to the Garden at the first annual show of the American Orchid Society..... 95

Page
Aquarium exhibit, view of, in the floral display house at the Garden, September 14 99
Frost flowers produced on pruned stems of crownbeard (*Verbesina virginica*) 104
Frost flowers 105
Henry Shaw, about 1865.....107
Orchid display, general view of.....127
Orchids, bank of, in floral display house.....128
White Tulipan (*Cattleya Trianae* var. *alba*).....129
Brasso-Cattleya "Penelope" 130
Rose garden, portion of, showing winter protection.....131
Roses, climbing, showing method of protecting.....131
Michaelmas daisies, four distinct types of.....134
Straw flowers, collection of.....135
"La Historia General de las Indias," by El Capitan Gonzolo Fernandez de Oviedo y Baldés, title-page of.....138
"La Historia General de las Indias" reproduction of page which contains first mention of tobacco and figure of primitive type..139
"La Historia General de las Indias" carta missiva of, bearing author's autograph 140

General Index

Figures in italics refer to page numbers of plates and cuts.

A

Acorns, white oak, as food, 32; used in making meal, *32;* muffins made from, *32*
Acroclinium roseum, 136
Addition, out-of-town, to the Garden, 3
Ailanthus, 69
Amaranth, globe, 136
American Orchid Society, the first exhibition of the, 61; medal awarded to Garden at, *94;* silver cup awarded to Garden at, *95*
Ammobium alatum, 136
Ampelopsis Hoggii, 87
Annual bequests, 9
Annual report of the director for 1923 (thirty-fifth), 1
Antirrhinum "Indian Summer," 135
Aquarium exhibit in the floral display house at the Garden, 2, *99*
Aquilegia californica, 72
Aralia pentaphylla, 69
Arsenal Street garden, an, 79, *80*, *82*
Artichoke, Chinese, 103
Aster Amellus, *134*, 135; *cordifolius*, *134*, 135; *novae-angliae*, *134*, 135; *novi-belgii*, *134*, 135
Attendance, Garden, for 1923, 22

B

Backyard gardens, 79
Barberry, 39; red Japanese, 136
Beautifying a railroad station, 83
Berberis Thunbergii, 39, 70
Bittersweet, false, 136
Black jack, 31
Brasso-Cattleya, 62; "Penelope," 129, *130*
Brasso-Laelio-Cattleyas, 62
Buxus sempervirens, 39

C

Cacalia coccinea, 136
Cattleya Schroederae, 128; *Trianae*, 128, var *alba*, 129, *129*.
Celastrus scandens, 136
Celosias, 135
Chrysanthemums, 135
City gardens, a spring visit to some, 79; what to plant in, 69
City planting zones, 74
Coleus parviflorus, 103
Colombia, expedition to, for orchids, 6
Columbines, 72
Construction at Garden during 1923, 1
Cornus florida, 71; *stolonifera*, 70
Crop Protection Institute, fellowship of, 16
Crownbeard, 105
Cup, silver, awarded to Garden at first annual show of the American Orchid Society, *95*
Cymbidiums, 62
Cypripediums, 63

D

Daffodil bulbs, poisoning caused by eating, 52
Dahlia show, first St. Louis, 2
Decree of court disposing of pasture land at Garden, 4
Director, thirty-ninth annual report of the, 1
Dogwood, flowering, 71

E

Eremurus for St. Louis, 41; at the Garden, *41*
Eremurus robustus, 42
Evergreens, 70; recommended for various St. Louis districts, 76

Expedition to Central and South America for orchids, 6

F

Fall flower show, 2
Fertilizers, grape, 49
Flora de Mayo, 128
Flower sermon, annual, 9
Forcing grapes, 45; peaches and nectarines, 57
Foxglove "The Shirley," 135
Frost flowers, 104, *105;* produced on pruned stems of crownbeard (*Verbesina virginica*), 104
Frost injury, protecting roses from, 129, *130*
Frost weed, 105
Frozen hedges and roses and their treatment, 37

G

Gaillardia "The Dazzler," 135
Garden Club of St. Louis, the fourth annual show of, 2
Geums, 135
Ginkgo biloba, 64, *64* 73
Golden chain, 93
Graduate students at Garden during 1923, 15
Grape: best varieties for forcing, 51; "Black Hamburg," *46;* control of insect and fungous pests affecting the, 51; cultivation of the, 48; excerpts from Henry Shaw's account of the, 45; Foster's Seedling, *47;* pruning the, 49; spraying the, 49

H

Hedges, frozen, treatment of, 37
Helianthemum canadense, 105
Helianthus angustifolius, 135; *cucumerifolius*, 135.
Helichrysum, 136
Herbarium, report of, for 1923, 18; exchanges, 19; field work, 19; mounting and distribution of specimens, 19; new accessions, 18; statistical summary, 20; use of, by outside botanists, 20
"Historia General de las Indias," 137, title-page, *138;* reproduction of page containing first mention of tobacco, *139*
Hoarhound, 103
Holly, 71
Horsemint, 103
Humphrey Street garden, 80, *80*
Hyptis spicigera, 103

I

Iris Kochii, 83; "Bluebird," 83

J

Japanese garden on Washington Boulevard, 81, *82*
Jonquils, toxic principle of, 52

L

Labiatae, 99
Laburnum anagyroides, 93, *93*
Laelio-Cattleya, 62; *luminosa* var. *aurea*, 129
Lantern-plant, Chinese, 136
Larkspurs, 72
Lavender, 100
Lavendula vera, 100
Lawns in St. Louis, 69; testing of grass mixtures for, 2
Lectures by members of Garden staff during 1923, 12
Library, report of, for 1923, 20; Garden publications as a means of exchange, 21; statistical, 22
Ligustrum, 39, 69; *amurense*, 39; *Ibota*, 39; *ovalifolium*, 37, 39
Lilacs, 70
Lily disease, 90
Linnean garden, changes in, 1
Linum hirsutum, 135
Lunaria annua, 136
Lycium, 69, 83
Lotus, 137

M

Maidenhair tree, the, 64; in fruit at the Garden, *64*
Maple tree in front of mausoleum, showing limbs and branches blown off by storm of July 17, 88
Marjoram, 101
Marrubium vulgare, 103
Matrimony vine, 83

Mausoleum gate, view through, towards old residence, *1*
Medal awarded to Garden at first show of American Orchid Society, *94*
Mentha, 99; *arvensis* var. *piperascens*, 100; *canadensis*, 100; *citrata*, 100; *piperita*, 99, var. *vulgaris*, 100, var. *officinalis*, 100; *Pulegium*, 100; *rotundifolia*, 100; *spicata*, 100
Michaelmas daisies, 134
Miltona, 62; *vexillaria*, 62
Mint family, some valuable members of the, 99
Missouri Botanical Garden, rank of, in comparison with other botanical institutions, 8
Monarda, 103
Mulberry, Chinese paper, 73

N

Narcissine, 52
Nectarine, forcing the, 57; "Stanwick," *57*; "Early Rivers," *58*
Nettles, stinging, 89
Nursery at Garden, 2
Nut orchard at the Garden, 71

O

Oak: black, 31; bur, large specimen of, at East Prairie, Missouri, *25*; chinquapin or yellow, 29; hybrid, 27; pin, 30; poison, 88; post, 27; red, 29; scarlet, 30; Schneck's, 30; swamp white, 28; shingle, 31; white, 26, acorns as food, 32, used in making meal, *32*, muffins made from, *32*
Oaks, in St. Louis, 71; local and their uses, 25
Ocimum sanctum, 103
Odontioda, 62
Odontoglossum crispum, 62
Oncidium Kramerianum, 129; *Papilio*, 129
Orchid: a new white from Panama, 53; exhibition, 127, *127*, *128*; Society, American, the first exhibition of the, 61
Orchids: 53, 91; exhibit of, at Horticultural Hall, Boston, 61, list of, of botanical interest shown by Garden, 63; expedition to Central and South America for, 6; medal awarded Garden at American Orchid Society show for collection of hand-colored photographs illustrating collecting of, *94*; packing for shipment, 92, *92*
Origanum Majorana, 102
Out-of-town addition to the Garden, 3, 70
Oviedo y Baldés, account of "La Historia General de las Indias" by, 137; autograph of, *139*

P

Packing orchids for shipment, 92
Parthenocissus quinquefolia, 87
Pasture land at Garden, disposal of, 4
Patchouli, 103
Paulownia, 73
Peach "Peregrine," 57
Peaches and nectarines, forcing, 57; control of insects and disease affecting, 61
Peonies, 70
Peppermint, 99, 102
Perennials, city-grown, 70, 72; list of, proving hardy, 73
Perilla, 99
Petunias, blue, 135
Physalis Francheti, 136
Plectranthus madagascariensis, 103
Pogostemon Heyneanus, 103
Poison ivy, 87, growing in association with Virginia creeper, *89*; spray of, *90*; remedies for, 90
Poisoning caused by eating daffodil bulbs, 52
Poplars, Lombardy, 70
Poppy, Oriental, 135
Primula poisoning, 90
Pring's orchid expedition to South America, 6
Privet: California, 70, pruning the, at the Garden, 37; "Lodense," 39; Regel's, 70; treatment of frozen, 37
Protecting roses from frost injury, 129, *131*
Pruning grapes, 50; roses, 39

Prunus Mahaleb, showing bark damaged by rabbits, *40*; *Persica*, 57, var. *nucipersica*, 57
Published articles and notes by members of staff and students during 1923, 11

Q

Quercus alba, 26, × *stellata*, 27; *bicolor*, 28; *coccinea*, 30; *imbricaria*, 31; *lyrata*, 27; *macrocarpa*, 28, var. *olivaeformis*, 28; *marilandica*, 31; *Muhlenbergii*, 29; *palustris*, 30; *rubra*, 29; *Schneckii*, 30; *stellata*, 27; *velutina*, 31

R

Rabbits that bark, 40; *Prunus Mahaleb*, showing damage due to, *40*; treatment of plants injured by, 41
Railroad station, beautifying a, 83, *84*
Research and instruction during 1923, 10
Rhus, 69, 73; *diversiloba*, 88; *verniciflua*, 88; *Toxicodendron*, 87; *vernix*, 88
Roses: pruning of, 39; frozen, treatment of, 39; at Garden, damage to, during recent years, 73; protecting, from frost injury, 129, *131*; smoke injury to, 132; varieties to plant in smoke areas, 133

S

Sage, 102
St. Louis, a valuable small flowering tree for, 93; a spring visit to some gardens in, 79; map of, showing zones with reference to vegetation, *69*, list of trees and shrubs recommended for different zones, 75
Salvia officinalis, 102
School for Gardening, 8
Senecios, 135
Shaw, Henry: about 1865, *107*; biographical sketch of, 107
Shrubs, city-grown, 70, 71; list of, recommended for different St. Louis zones, 77
Smoke injury to roses, 132
Snowberry, 136
Spike grass, 136
Spring visit to some St. Louis gardens, 79
Stachys Sieboldii, 103
Statice latifolia, 136; *sinuatum*, 136; *spicata*, 136; *Suworowii*, 136
Statistical information for December, 1923, 23; January, 1924, 35; February, 44; March, 56; April, 67; May, 85; June-August, 96; September, 106; October, 124; November, 142
Straw flowers, 136
Sumac, poison, 88

T

Tassel-flower, 136
Test garden, the, 134
Thyme, 102
Thymus vulgaris, 102
Tobacco: flowering, 135; the first recorded account of the use of, and the instrument through which it was inhaled, 137, *139*
Tower Grove station garden, 83, *84*
Tree-of-heaven, 69
Trees: at the Garden, showing damage caused by wind storm of July 17, *87*, 88; city-grown, 71; list of, recommended for different St. Louis zones, 75
Trichopilia coccinea, an unusual specimen of, 91, *91*; *marginata* var. *alba*, 53; *suavis*, *52*, var. *alba*, *53*
Trustees' banquet, 9
Tulipan, 128, *129*

U

Uniola latifolia, 136
Utah Place garden, 80, *81*, *83*

V

Valuable small flowering tree for St. Louis, a, 93
Verbena "Mayflower," 135
Verbesina virginica, 105

Viola lutea splendens, 135; *Papilio*, 135
Virginia creeper, 87; growing in association with poison ivy, *89*; spray of, *90*
Vocational students in School for Gardening, 9

W

Washington Boulevard garden, a, 81, *82*
Water-lilies exhibited by Garden at fall flower show, 2
Westminster Place garden, a, *81*, 82, *83*
What to plant in city gardens, 69
White-oak acorns as food, 32
Wind storm, showing damage caused by, to trees at Garden, *87*, *88*
Wren, house, novel resting place of a, *45*

X

Xeranthemum annuum, 136

STAFF
OF THE MISSOURI BOTANICAL GARDEN

GEORGE T. MOORE,
Director

BENJAMIN M. DUGGAR
Physiologist in charge of Graduate Laboratory

EDGAR ANDERSON
Geneticist

HERMANN VON SCHRENK
Pathologist

LIONEL E. TISDALE
Research Assistant

JESSE M. GREENMAN
Curator of Herbarium

KATHERINE H. LEIGH
Secretary to the Director

EDWARD A. BURT
Mycologist and Librarian

NELL C. HORNER
Editor of Publications

G. H. PRING
Horticulturist

PAUL A. KOHL
Floriculturist

JOHN NOYES
Landscape Designer

EDGAR ANDERSON
In charge of School for Gardening

P. C. BRAWNER
Painter

J. LANGAN
Assistant Engineer

J. CUTAK
Exotics

C. McGOVERN
Outside Floral Display

W. C. FAIRBANK
Plant Recorder

D. MILLER
Orchids

A. HUBER
Aquatics

G. NINTEMAN
Construction and Farms

J. H. KELLOGG
Herbaceous and Nursery

J. ULRICH
Inside Floral Display

W. F. LANGAN
Engineer

H. VALLENTINE
Carpenter